EVERGLADES AGRICULTURAL AREA
A-1 SHALLOW FLOW EQUALIZATION BASIN

Final Environmental Impact Statement

U.S. Army Corps of Engineers
Jacksonville District

July 2013

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EVERGLADES AGRICULTURAL AREA SHALLOW FLOW EQUALIZATION BASIN

FINAL ENVIRONMENTAL IMPACT STATEMENT

Responsible Agency: The lead agency is the U.S. Army Corps of Engineers, Jacksonville District. Cooperating Agencies include the U.S. Department of Interior and the U.S. Environmental Protection Agency.

Abstract: The South Florida Water Management District (SFWMD) proposes to construct and operate a Shallow Flow Equalization Basin (FEB) in Palm Beach County, Florida. The Shallow FEB is an above-ground 60,000 acre-foot impoundment with a maximum operating depth of 4 feet. The Shallow FEB would be constructed on 16,517.9 acres of land situated north of Stormwater Treatment Area (STA) 3/4 and between the Miami and North New River Canals in the Everglades Agricultural Area (EAA). As proposed, construction of the Shallow FEB would place fill within 280.1 acres of freshwater marsh wetlands to construct levees, place fill within 112.8 acres of canals to create appropriate wetland elevations, and excavate 43.0 acres of freshwater marsh wetlands to create canals and ditches. Operation of the Shallow FEB would inundate 10,820.3 acres of jurisdictional wetlands and 1,214.7 acres of uplands to create an emergent marsh habitat. The SFWMD is required to obtain a Department of the Army permit pursuant to Section 404 of the Clean Water Act. This Final Environmental Impact Statement evaluates the environmental effects of four (4) alternatives: the No Action Alternative, the SFWMD's Preferred Alternative (the Shallow FEB), a deep FEB Alternative, and a Stormwater Treatment Area Alternative. The overall project purpose, as defined by the USACE, is to achieve the Water Quality Based Effluent Limit at the STA 2 and STA 3/4 discharge points in the Central Flowpath of the Everglades Protection Area. To achieve this, the Shallow FEB project would retain and deliver water at improved timing to the STAs so that the STAs perform at a more optimized efficiency.

THE OFFICIAL CLOSING DATE FOR THE RECEIPT OF COMMENT IS 30 DAYS FROM THE DATE ON WHICH THE NOTICE OF AVAILABILITY OF THIS FINAL EIS APPEARS IN THE FEDERAL REGISTER

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EXECUTIVE SUMMARY

FINAL ENVIRONMENTAL IMPACT STATEMENT

EVERGLADES AGRICULTURAL AREA A-1 SHALLOW FLOW EQUALIZATION BASIN IN PALM BEACH COUNTY, FLORIDA

A. BACKGROUND

The South Florida Water Management District (SFWMD) is requesting regulatory authorization from the United States Army Corps of Engineers (USACE), in the form of a Department of the Army (DA) permit pursuant to Section 404 of the Clean Water Act, to construct a Shallow Flow Equalization Basin (FEB) on the A-1 project site in the Everglades Agricultural Area (EAA). The A-1 project site is approximately 16,517.9 acres and bordered to the east by US Highway 27, to the south by Stormwater Treatment Area (STA) 3/4, to the west by an area known as the Holey Land Wildlife Management Area (Holey Land) and to the north by agricultural lands.

The Shallow FEB is designed to improve the phosphorus treatment performance in STAs 2 and 3/4 by retaining and then delivering water to the STAs with improved flow and timing, which is expected to increase the effectiveness of phosphorus treatment in the STAs prior to discharge in the Everglades Protection Area (EPA). Since the A-1 Site was purchased with Farm Bill Funds, the SFWMD will request approval for a land use change from the United States Department of the Interior (DOI)/U.S. Fish and Wildlife Service (USFWS).

B. NEED FOR PROPOSED ACTION

The SFWMD is required to meet a numeric discharge limit, referred to as the Water Quality Based Effluent Limit (WQBEL) that is contained in the National Pollutant Discharge Elimination System (NPDES) permit for discharges from the STAs into the EPA. The WQBEL was developed to assure that such discharges do not cause or contribute to exceedances of the 10 parts per billion (ppb) total phosphorus (TP) criterion (expressed as a long-term geometric mean [LTGM]) established under 62-302.540, Florida Administrative Code (F.A.C.) (SFWMD – Final Technical Support Document for the WQBEL 2012). The TP criterion is measured at a network of stations across the EPA marsh and is intended to prevent imbalances of aquatic flora and fauna. The WQBEL is measured at the discharge points from each STA and requires that the total phosphorus concentration in STA discharges shall not exceed: 1) 13 ppb as an annual flow-weighted mean in more than three out of five water years on a rolling basis; and 2) 19 ppb as an annual flow-weighted mean in any water year. Excess phosphorus discharged into the EPA has caused ecological impacts within the Everglades.

Although phosphorus levels in the discharges from STA 2 and STA 3/4 have been reduced during the years that these STAs have been operating, STA discharges have not consistently achieved the phosphorus concentrations described in the WQBEL that was established in 2012. As a result of technical discussions in early 2010, the SFWMD, Florida Department of Environmental Protection (FDEP), and the U.S. Environmental Protection Agency (USEPA) developed a plan to ensure that discharges into the EPA do not cause or contribute to exceedances of the State of Florida's 10 ppb TP numeric phosphorus criterion entering into the EPA. The above agencies identified a suite of water quality projects that would work in conjunction with the existing Everglades STAs to meet the WQBEL at the discharge points from the STAs. As a result of these technical discussions, on September 10, 2012, FDEP issued NPDES and Everglades Forever Act (EFA) permits for the existing Everglades STAs and consent orders establishing the WQBEL and the suite of water quality improvement projects to be constructed. The Shallow FEB at the A-1 project site is the project proposed by the SFWMD to achieve the WQBEL within the Central Flowpath of the EPA.

The SFWMD is proposing to meet the WQBEL in flows from STA 2 and STA 3/4 by using a shallow FEB at the A-1 project site to temporarily store excess water from within the central EAA, collected by the North New River and Miami Canals. This water is then delivered from the Shallow FEB to STA 2 (including Compartment B) and STA 3/4 at an improved rate. By managing basin runoff in the Central Flowpath in a more advantageous manner, the impacts of storm driven events would be reduced for STA 2 and STA 3/4. The proposed projects will also improve operations of the STAs in the dry season by providing water during the periods of drought and low water conditions. Attenuating and managing excess water flows in the Central Flowpath is intended to enhance operations and improve phosphorus treatment performance in STA 2 and STA 3/4 so that these STA discharges meet the WQBEL.

The goals and objectives are to assist STA 2 and 3/4 in achieving the WQBEL at the STA discharge points in three ways:

1. Attenuate peak water flows and temporarily store runoff from the central EAA, thereby minimizing the discharge of untreated water into the EPA,
2. Improve inflow delivery rates to STA 2 and STA 3/4, thereby providing enhanced operation and phosphorus treatment performance, and
3. Assist in maintaining minimum water levels and reducing the frequency of dryout conditions within STA 2 and STA 3/4, which will sustain phosphorus treatment performance.

The overall project purpose, as defined by the USACE, is to achieve the WQBEL at the STA 2 and STA 3/4 discharge points into the Central Flowpath of the EPA. The project construction completion milestone is July 2016 as established in the Consent Order (OGC #12-1148).

C. SCOPE OF ANALYSIS

The USACE determined that the scope of this Final Environmental Impact Statement (EIS) includes the A-1 project site, the STAs that the proposed project would assist (STAs 2 and 3/4), the Everglades Water Conservation Areas that receive the STAs discharges (WCA 2A and 3A), and the Holey Land. The A-1 project site was originally purchased using Department of the Interior's (DOI) Farm Bill funds for the Comprehensive Everglades Restoration Plan EAA A-1 Storage Reservoir project and is subject to land use restrictions; therefore, the land use of the site is a major component of the scope of analysis. The EAA was historically Everglades wetlands, which has now been ditched and drained. Much of the EAA canal system, including the extensive network of ditches and canals along the perimeter of the site, is considered to be "navigable waters of the United States" under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act. The lands within the A-1 project site have been previously farmed. However, the lands were taken out of agricultural use and the wetland hydrology, hydric plants, and hydric soils have returned. Therefore, the USACE's regulatory jurisdiction under Section 404 of the Clean Water Act includes the project site as well as wetlands and aquatic resources that will be affected as a result of the project. A number of federally listed species utilize the project site as well as other natural areas that will be affected by the project. Taking these factors into consideration, the proposed project is subject to substantial federal control and responsibility and the scope of analysis is extended over the entire site.

D. ALTERNATIVES CONSIDERED

This Final EIS evaluates construction of the applicant's (SFWMD) preferred alternative, which is a Shallow FEB on the A-1 project site. The USACE will analyze a range of alternatives to determine if the applicant's preferred alternative is the least environmentally damaging practicable alternative, and if the applicant's preferred alternative is not contrary to the public's interest. The range of alternatives considered in this EIS include the No Action Alternative, the Applicant's Preferred Alternative (Shallow FEB), a Deep FEB, and an STA. The potential effects of the Alternatives would largely be a function of the manner in, and degree to which, the Alternative features are used in the context of other regional water management infrastructure and system operations made possible by the presence of the enhanced water management options and phosphorus treatment performance. The No Action Alternative and Alternatives 2 (Shallow FEB), 3 (Deep FEB), and 4 (STA) are presented to compare the differences in regional water management infrastructure to effectively meet the project purpose.

E. DESCRIPTION OF ACTION ALTERNATIVES

Alternative 2 (Shallow FEB)

Alternative 2 is a 15,000-acre Shallow FEB, with a maximum operating depth of approximately 4 feet, and is SFWMD's Preferred Alternative to be evaluated in this EIS. The Shallow FEB was assumed to include the following components, at a minimum:

- Perimeter Levees around the FEB (> 20 miles; 8-10 feet levee heights for 4 feet maximum operating depth)
- Interior levees to convey inflows to the north end of the FEB (8.7+/- miles)
- Internal collection canal to assist in conveying water out of the FEB
- Operable water control structures to control FEB water levels and flows into and out of the FEB
- Seepage canal and pump station(s) to collect FEB seepage and return to FEB/STA-3/4
- Degradation of portions of major agriculture roads
- Demolition of the existing test cells
- Demolition of the existing Talisman and Cabassa pump stations

The majority of the Shallow FEB outflows (approximately 80%) will be directed to STA 3/4 for treatment while the remaining flows (approximately 20%) will be conveyed to STA 2 (including Compartment B) via the G-434 and G-435 pump stations.

Alternative 3 (Deep FEB)

Alternative 3 is a 15,000-acre Deep FEB, with a maximum operating depth of approximately 12.5 feet. Alternative 3 was assumed to include the following components, at a minimum:

- Perimeter Levees around the FEB (> 20 miles; 20-30 feet levee heights for a maximum operating depth of 12.5 feet)
- Inflow Pump Station to direct North New River Canal flows into the FEB to the maximum operating depth of 12.5 feet
- Internal collection canal to assist in conveying water out of the FEB
- Operable water control structures to control FEB water levels and flows into and out of the FEB
- A cutoff wall to minimize or eliminate seepage impacts to adjacent areas
- Seepage canal and pump station(s) to collect FEB seepage and return to FEB/STA 3/4
- Degradation of portions of major agriculture roads
- Demolition of the existing test cells
- Demolition of the existing Talisman and Cabassa pump stations

The majority of the Deep FEB outflows (approximately 60%) will be will be directed to STA 3/4 for treatment while the remaining flows (approximately 40%) will be conveyed to STA 2 (including Compartment B) via the G-434 and G-435 pump stations.

Alternative 4 (STA)

Alternative 4 is a 15,000-acre STA, with a maximum operating depth of approximately 4 feet. The proposed STA would have a normal operating depth of approximately 1.25 – 1.5 feet and a maximum operating depth of approximately 4 feet. Alternative 4 would operate in parallel with STA 2 and STA 3/4. Alternative 4 was assumed to include the following components, at a minimum:

- Perimeter Levees around the STA (> 20 miles; 8-10 feet levee height for 4 feet maximum operating depth)
- Interior levees dividing the STA into cells
- Inflow canals to direct inflows from the North New River and Miami Canals to the STA
- Discharge canal to direct outflows from the STA to the L-5 Canal
- Internal distribution canals to facilitate sheetflow through the cells
- Internal collection canals to assist in conveying water out of the cells
- Seepage canal and pump station(s) to collect STA seepage and return to STA
- Operable water control structures to control water levels and flows into and out of all STA cells

In order to operate the new STA, construction of conveyance features in addition to construction of the STA itself will be required. Specifically, a discharge canal would need to be constructed within the Holey Land to connect the STA discharge canal to the L-5 Canal. This would enable the delivery of discharges with low phosphorus from the proposed STA to WCA 2A and/or WCA 3A via existing infrastructure, without interfering with the existing operations of STA 2, STA 3/4 and the North New River and Miami Canals.

F. SUMMARY OF ENVIRONMENTAL EFFECTS

The effects of the alternatives on the environment were evaluated. Many of the environmental effects were similar between Alternatives 2, 3, and 4. However, changes to the affected environment are seen in land use, soils/total phosphorus removal, surface water, water quality, and wetland impacts as a result of the Alternatives and discussed further in Section 4.22. For Table 4-16 below, a “+” is a positive effect, a “0” is a neutral effect, while a “-“ is a negative effect.

Table 4-16 Summary of Environmental Effects

	No Action	Shallow FEB		Deep FEB		STA	
Land Use on A-1 project site	Project would not require land use change from USFWS/DOI	+	Requires verification from USFWS/DOI for land use change	+	Requires verification from USFWS/DOI for land use change	+	Requires verification from USFWS/DOI for land use change
Geology		-	Some removal of cap rock	-	Some removal cap rock	-	blasting cap rock
Topography		0	10 foot levees	0	25 foot levees	0	10 foot levees
Soils							
A-1 project site		+	Soils remain hydric in shallow water depths	-	Deep water depths result in less organic debris and nutrients	+	Soils remain hydric in shallow water depths
TP removal	- no reduction in TP concentrations in soil	+	Benefit soils in WCAs 2A and 3A by reducing TP concentration in soils	+	Benefit soils in WCAs 2A and 3A by reducing TP concentration in soils	+	Benefit soils in WCAs 2A and 3A by reducing TP concentration in soils
Water							
Hydroperiod		0	WCA 2A 17 days per year longer hydroperiod; in 600 acres (0.6% of total area) WCA 3A 14-30 days per year shorter hydroperiod in 11,000 acres (2.2% of total area)	0	WCA 2A 15-18 days per year longer hydroperiod in 3,000 acres (3.1% of the area); WCA 3A 14-30 days shorter hydroperiod in 1,000 acres (0.2% of the area)	0	WCA 2A 13,000 ac-ft per year less flow with no change in ponding and hydroperiod; WCA 3A 28,000 ac-ft per year less flow with no change in ponding and hydroperiod
Ground water	0	0	No changes	0	No changes	0	No changes
Water Quality	- does not meet WQBEL	+	Meets WQBEL	+	Meets WQBEL	+	Meets WQBEL

Vegetation							
Type		+	EAV	0	FAV	+	SAV and EAV
Wetland impacts (acres)		+	323.1	-	533.6	-	603.6 (353.6 onsite and 250 acre at Holey Land)
Fish and Wildlife							
Federally listed T&E		0	Requires BO for eastern indigo snake	0	Requires BO for eastern indigo snake	0	Requires BO for eastern indigo snake
State listed T&E		0	No adverse effects	0	No adverse effects	0	No adverse effects
Migratory Birds		0	no Avian Protection Plan required	0	No Avian Protection Plan required	0	Avian Protection Plan implemented
Other Issues							
Cultural Historic and archeological resources	No impacts	0	No impacts	0	No impacts	0	No impacts
Tribal rights		0	No change in water supply	0	No change in water supply	0	No change in water supply
Recreational Resources	No resources on project site	+	Recreational plan would be developed on project site	+	Recreational plan would be developed on the project site	+	Recreational plan would be developed on project site
Aesthetics		0	Negligible change from existing conditions	0	Negligible change from existing conditions	0	Negligible change from existing conditions
Flood protection		0	No adverse impacts. Is able to meet flood protection	+	No adverse impacts. Is able to meet flood protection	0	No adverse impacts. Is able to meet flood protection
Hazardous and toxic waste		0	No impact	0	No impact	0	No impact
Climate	No impact	0	No impact	0	No impact	0	No impact
Cost		+	$60,000,000 cost the least	-	$493,000,000 (costs the	-	$288,000,000

			of the action alternatives		most of the action alternatives		
Environmental Justice	No impacts	0	No impacts	0	No impacts	0	No impacts
Natural or Depleatable resources	Increased agricultural or mining	+	No mining or agriculture	+	No agriculture or mining	+	No agriculture or mining

The evaluation of environmental impacts indicates that among the alternatives that are projected to meet the WQBEL at both STAs, the SFWMD's Preferred Alternative (the shallow FEB) is the least expensive and also has the lowest wetland impact. The changes in hydroperiod in the downstream Everglades (WCA 2A and WCA 3A) in each of the Action Alternatives is negligible.

G. AREAS OF POTENTIAL CONTROVERSY

This project is being developed with input and consensus from federal and state agencies, local agencies and the public. There is currently ongoing coordination with the Seminole Tribe of Florida, Miccosukee Tribe of Indians of Florida, USFWS, DOI, USEPA, Florida Fish and Wildlife Conservation Commission (FFWCC), and Florida Department of Environmental Protection (FDEP) to address concerns regarding impacts such as wetlands, water quality, flood protection, wildlife and habitat, and threatened and endangered species. Numerous meetings have occurred with the various agencies and the public in the context of identifying areas of potential controversy and resolving or mitigating for those concerns. Through the coordination process and meetings with the agencies, all areas of potential controversy, in particular the compensatory mitigation, have been resolved.

H. LIST OF OTHER GOVERNMENT ACTIONS REQUIRED

The SFWMD shall be responsible for obtaining federal, state and local permits, licenses and meet other consultation requirements for the proposed project, as described in this section and Chapter 8 of the main report.

The USACE's permitting decision is required to comply with many federal requirements including the National Environmental Policy Act (NEPA), Clean Water Act (CWA), Endangered Species Act (ESA), Rivers and Harbors Act, Coastal Zone Management Act (CZMA), Fish and Wildlife Coordination Act of 1958, and the National Historic Preservation Act. The USACE will consider other relevant environmental laws as well as protection of wetlands, floodplain management, environmental justice, and invasive/exotic species.

State requirements that will need to be satisfied for this project include an Everglades Forever Act (EFA) permit for construction and operation of the FEB. A consumptive use/water use permit will also need to be obtained for any construction dewatering prior to dewatering activities. In addition, a National Pollution Discharge Elimination System (NPDES) Permits (Notice of Intent to use Generic Permit for stormwater discharges from large and small construction activities) would also need to be obtained prior to start of construction. The Florida Department of Environmental Protection (FDEP) is currently processing a permit application from the SFWMD for the Shallow FEB under file number 0313994-001.

Local permitting authority for the proposed EAA A-1 Shallow FEB project resides with several county Departments and Divisions. Primary coordination of local permit review will be administered by Palm Beach County's Planning, Zoning and Building (PZB) Division.

The SFWMD will be required to obtain approval from the USFWS/DOI for a land use change on the A-1 project site.

The USACE made a determination that the SFWMD's proposed Shallow FEB project may affect, but is not likely to adversely affect the Audubon's crested caracara, the Florida panther, the Everglade snail kite, and the wood stork; and may adversely affect the eastern indigo snake. The USACE is currently in formal consultation with the USFWS.

I. UNRESOLVED ISSUES

The SFWMD proposes to obtain ecological lift within the boundary of either the Deep FEB or STA for hydrologic and vegetation benefits expected from the additional retained water. The USACE determined that the compensatory mitigation plan of utilizing on-site ecological lift within the Deep FEB or STA alternatives was not possible at this time. The Deep FEB would not be expected to support adequate wetland vegetation due to periods of flooding greater than 4-feet following by periods of drawdown. Based on USEPA's Guiding Principles for Constructed Treatment Wetlands, the STA Alternative would provide compensatory mitigation within a treatment area that the USACE has only utilized past treatment wetlands to offset impacts to agricultural wetlands.. If the Deep FEB or the STA alternative were selected, further discussions would need to occur to develop an appropriate mitigation plan. The USACE does not have any concerns with the mitigation plan for the Shallow FEB. The USACE agrees that the Shallow FEB would provide wetland benefits and the loss of wetland function and value is offset.

The Shallow FEB Alternative would provide significantly more mitigation credit than is needed to offset the impacts from construction. The USACE is evaluating whether it is appropriate to utilize the excess functional capacity units from the Shallow FEB Alternative as compensatory mitigation to offset wetland impacts for future projects. The Shallow FEB will be operated as a water storage site to enhance the operation of the STAs. The Shallow FEB will accept water during storm events, and supply water to the STA during the dry season. The USACE recognizes that the Shallow FEB would be susceptible to more drastic changes in water elevations and will sacrificially experience dry-out conditions in favor STA 2 and STA 3/4. These changes in hydrology will cause the wetland community to change between marsh wetlands and wet prairie wetlands, with dryer dry periods. The USACE recognizes that this is a great benefit for water quality purposes within the EPA and an improvement to the current site conditions on the project site. However, the effects from changes in hydrology on the wetlands at the project site may not make appropriate mitigation to offset future impacts for other projects, especially if there is dissimilar vegetation or hydroperiod as this would be out of kind. This option would be evaluated on a case by case basis for each future project.

J. COMPENSATORY MITIGATION TO OFFSET THE LOSS OF WETLAND FUNCTION AND VALUE

The compensatory wetland mitigation plan for Alternatives 2 includes hydrologic and vegetation benefits within the footprint of the project. By retaining additional water on the site, it is anticipated that the hydrology and the vegetation community within the footprint of the project would improve from the current condition. In assessing the pre- and post-project conditions of the wetlands with UMAM, the project results in an environmental benefit (or excess credits). The FDEP, the USFWS and the USEPA have agreed upon and finalized the Uniform Mitigation Assessment Method (UMAM) scores, incorporating an appropriate UMAM scores, time lag and risk associated with the Compensatory Mitigation Plan as described in Chapter 5. Therefore, all concerns with the UMAM analysis have been resolved. The SFWMD's Preferred Alternative (Alternative 2) results in a surplus of 1,510.5 credits.

K. COORDINATION

Throughout the evolution of project design alternates, federal and state agencies, county officials, and the public have been kept informed through a scoping meeting, social media, news release, and public notices designed to inform, gather input, and respond to questions regarding the proposed project. The public, government agencies, federally-recognized Native American Tribes, and interested parties are afforded the opportunity to provide input regarding this project by reviewing and commenting on the draft and final EIS. Project information, schedules, documents, and presentations to the public are also kept updated and available on the USACE website: http://www.saj.usace.army.mil/Missions/Regulatory/ItemsofInterest.aspx.

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ACRONYMS

Ac-ft	acre-feet
AD	Amended Determination
BA	Biological Assessment
BAR	Bureau of Archaeological Research
bgs	below ground surface
BMPs	best management practices
C&SF	Central and Southern Florida
CAA	Clean Air Act
CARL	Conservation and Recreational Lands
CEPP	Central Everglades Planning Project
CERP	Comprehensive Everglades Restoration Plan
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
COC	constituents of concern
Compact	Water Rights Compact
Cooperative Agreement	*Cooperative Agreement Among the United States Department of the Interior and the Nature Conservancy and the South Florida Water Management District*
COP	Combined Operation Plan
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
DA	Department of the Army
DDT	dichlorodiphenyltrichloroethane
Decomp	Decompartmentalization and Sheetflow Enhancement of WCA 3
DMSTA	Dynamic Model for Stormwater Treatment Areas
DOI	U.S. Department of Interior
EAA	Everglades Agricultural Area
EAV	emergent aquatic vegetation
ECP	Everglades Construction Project
EFA	Everglades Forever Act
EIS	Environmental Impact Statement
ENP	Everglades National Park
EPA	Everglades Protection Area
ERA	Environmental Risk Assessment
ERP	Environmental Resource Permit
ERTP	Everglades Restoration Transition Plan
ESA	Endangered Species Act
ESAs	Environmental Site Assessments
ESWCD	East Shore Water Control District
ET	Evapotranspiration
FAC	Florida Administrative Code

Farm Bill	1996 Federal Agriculture Improvement and Reform Act
FCU	Functional Capacity Units
FDEP	Florida Department of Environmental Protection
FEB	Flow Equalization Basin
FMSF	Florida Master Site File
FOE	Friends of Everglades
FWCC	Florida Fish and Wildlife Conservation Commission
FWMC	flow weighted mean concentration
FY	Fiscal Year
Holey Land	Holey Land Wildlife Management Area
HTRW	Hazardous, Toxic and/or Radioactive Waste
IOP	Interim Operational Plan
LECSA	Lower East Coast Service Area
LEDPA	least environmentally damaging practicable alternative
Long-Term Plan	Long-Term Plan for Achieving Water Quality Goals in Everglades Protection Area Tributary Basins
LORS	Lake Okeechobee Regulation Schedule 2008
LORSS	Lake Okeechobee Regulation Schedule Study
LTGM	long-term geometric mean
Miccosukee Tribe	Miccosukee Tribe of Indians of Florida
MOA	Memorandum of Agreement
mt	metric tons
MWD	Modified Water Deliveries
NAVD	North American Vertical Datum
NECPP	Northern Everglades and Estuaries Protection Program
NEPA	National Environmental Policy Act
NFA	No Further Action
NGVD29	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PAH	polynuclear aromatic hydrocarbons
ppb	parts per billion
PSTA	Periphyton-based STA
project site	Compartment A-1
the Refuge	Arthur R. Marshall Loxahatchee National Wildlife Refuge
RWQP	Regional Water Quality Plan
RSM	Regional Simulation Model
SAV	submerged aquatic vegetation
SCTLs	soil cleanup target levels
SDCS	South Dade Conveyance System

Seminole Tribe	Seminole Tribe of Florida
SFER	South Florida Environmental Report
SFWMD	South Florida Water Management District
SFWMM	South Florida Water Management Model
SHPO	State Historic Preservation Officer
SLOPES	Standard Local Operating Procedures for Endangered Species
SRCO	Site Rehabilitation Completion Order
SSC	Species of Special Concern
STA	Stormwater Treatment Area
TMDL	total maximum daily load
TP	total phosphorus
UMAM	Unified Mitigation Assessment Methodology
US	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	U.S Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
Water Control Plan	C&SF Project Water Control Plan for Lake Okeechobee
WCA	Water Conservation Area
WCD	Water Control District
WMAs	Wildlife Management Areas
WQBEL	Water Quality Based Effluent Limits
WQC	Water Quality Certification
WRDA	Water Resource Development Act
WY	Water Year

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CHAPTER 1

PURPOSE OF AND NEED FOR ACTION

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The South Florida Water Management District (SFWMD) has submitted an application to the U.S. Army Corps of Engineers, Jacksonville District, Regulatory Division (USACE) for a Department of the Army (DA) permit authorizing the discharge of dredge or fill material into waters of the United States (US), including wetlands under Section 404 of the Clean Water Act (CWA) for construction of a shallow Flow Equalization Basin (FEB). The FEB is proposed in western Palm Beach County, Florida, on land designated as Compartment A-1 (A-1 project site) within the Everglades Agricultural Area (EAA) (**Figure 1-1**). The A-1 project site is approximately 16,000 acres and bordered to the east by US Highway 27, to the south by Stormwater Treatment Area (STA) 3/4, to the west by an area known as the Holey Land Wildlife Management Area (Holey Land) and to the north by agricultural lands.

Water flowing south from Lake Okeechobee can be separated into three flowpaths: the Western flowpath that extends beyond the EAA to the west, the Central flowpath, which is the bulk of the EAA, and the Eastern flowpath (**Figure 1-2**). These flowpaths are delineated by the source basins that route flows into the existing Everglades STAs. The project site is in the southern portion of the Central EAA flowpath. The Central EAA is mainly comprised of the S-2, S-3, S-6, S-7, and S-8 drainage basins and also includes the following independent water management or drainage districts established by Chapter 298 Florida Statutes (commonly referred to as 298 Districts): South Florida Conservancy District, South Shore Drainage District, East Shore Water Control District (ESWCD), and 715 Farms (**Figure 1-3**). Currently, the North New River and Miami Canals route flows from these basins and 298 Districts into STA 2, Compartment B, and STA 3/4 for phosphorus treatment prior to discharging into Water Conservation Area (WCA) 2A and WCA 3A. Water can be diverted around the STAs and discharged directly into the WCAs, referred to as “diversions”. For example, during extreme storm events, diversions could occur as water is sent directly from the canals into the WCAs without entering into the STAs if the water volumes in the canals exceed the capacity of the STAs. Alternately, when dry conditions in the Lower East Coast may lead to salt water intrusion, water is delivered directly from the canals into the WCAs to help maintain the freshwater gradient in the coastal wells. Water diversions in the dry season are referred to as urban water supplies.

Figure 1-1 A-1 Project Site Location Map and Surrounding Features

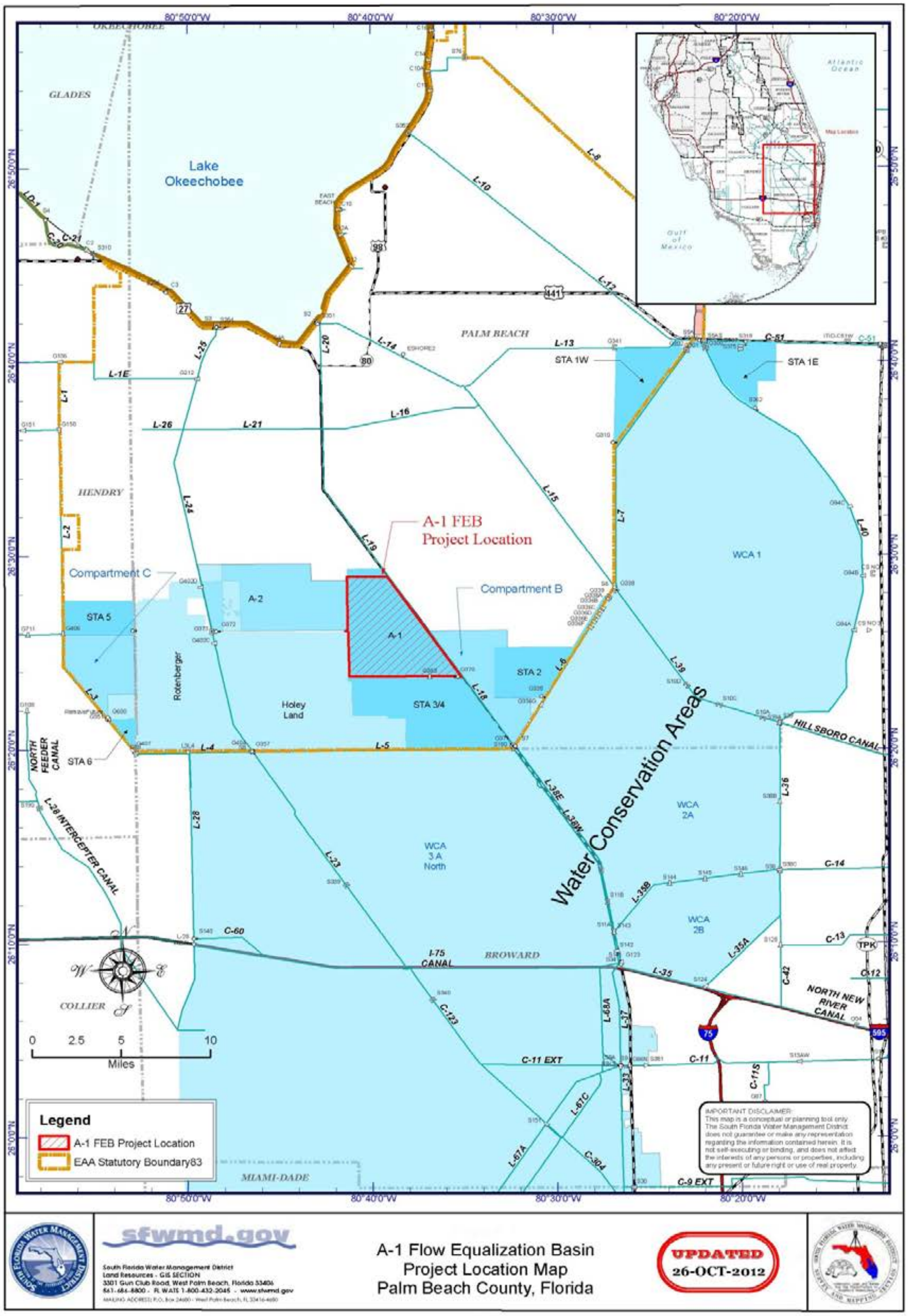


Figure 1-2 Location Map of Western, Central, and Eastern Flowpaths

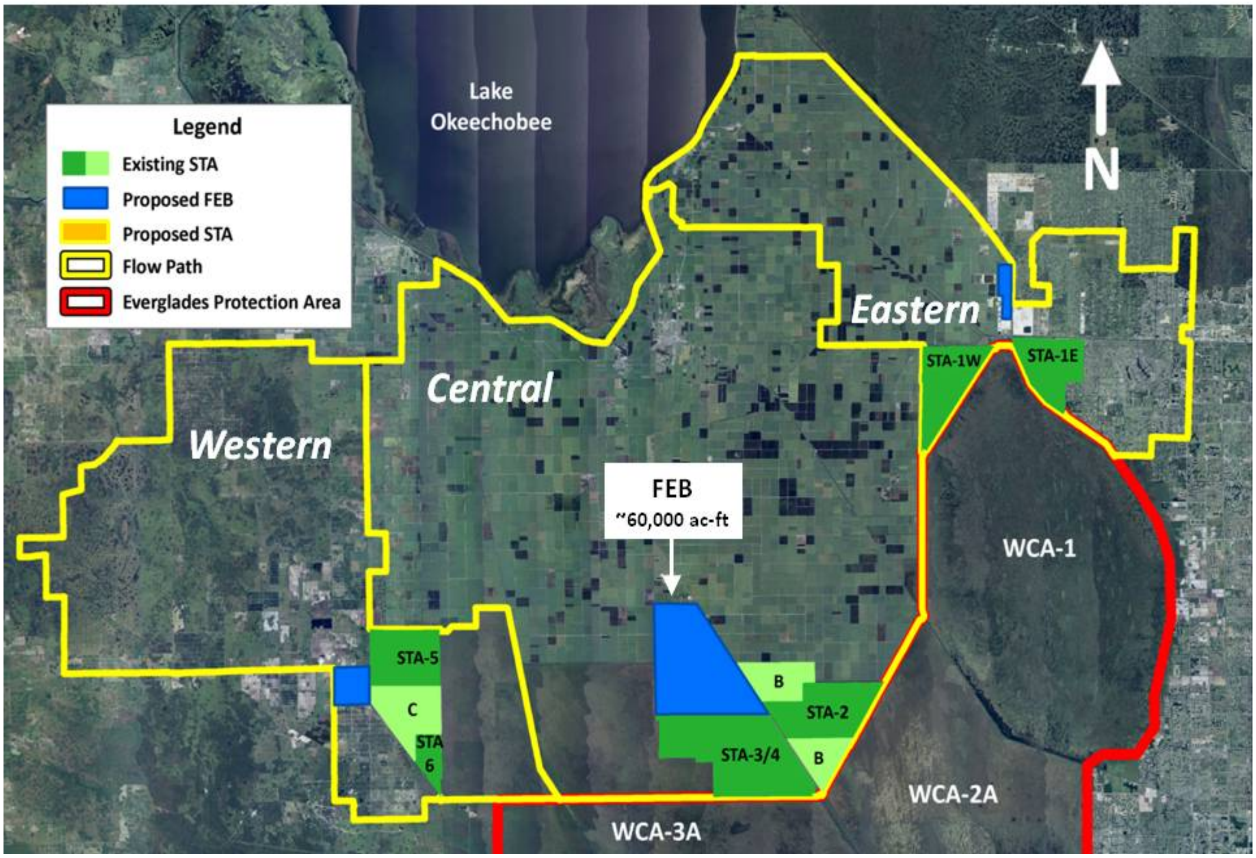
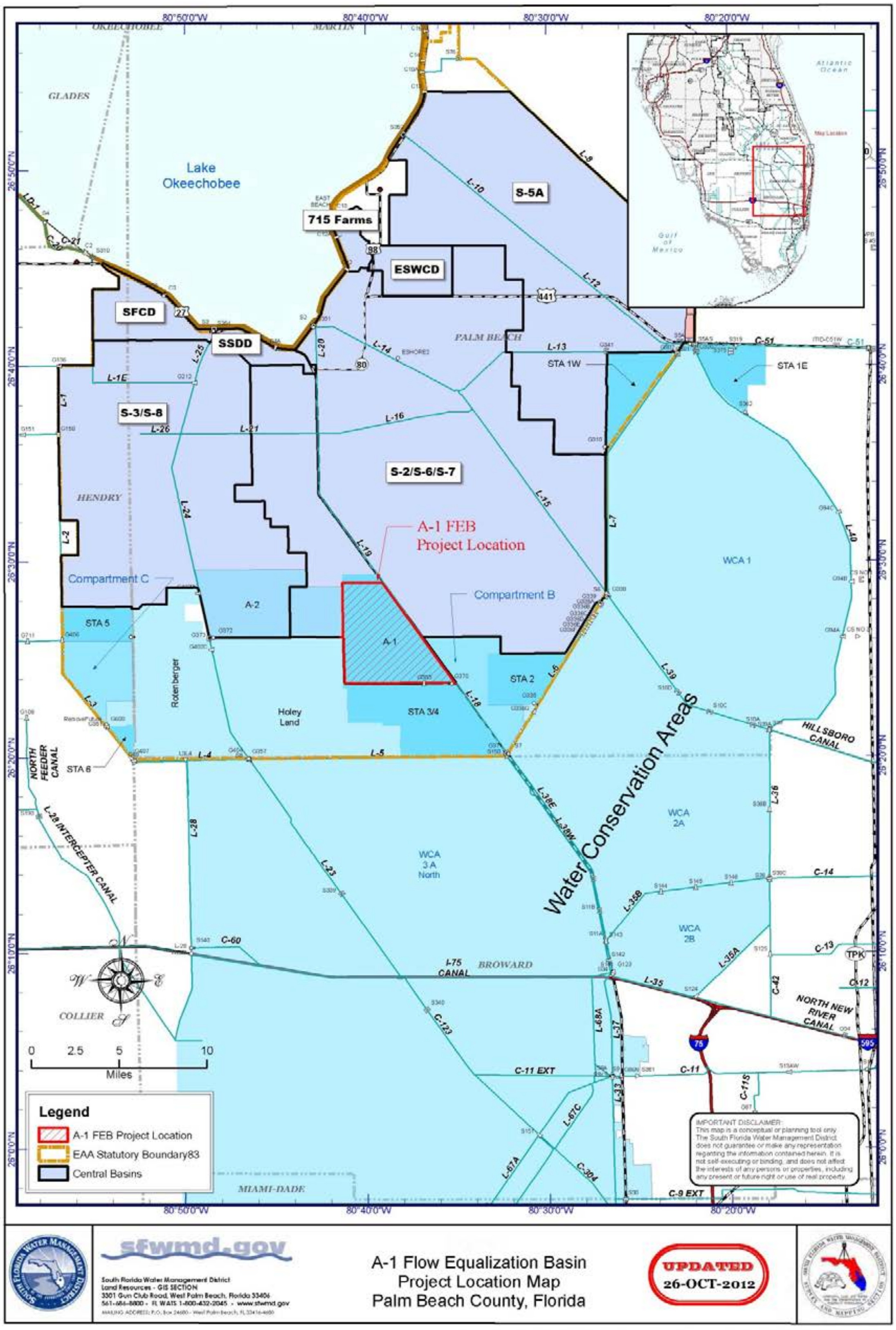


Figure 1-3 Location Map of Source Basins



1.2 NATIONAL ENVIRONMENTAL POLICY ACT REQUIREMENTS

The USACE anticipates a decision on the proposed activities which would constitute a Major Federal Action in accordance with 40 Code of Federal Regulations (CFR) Section 1501.8 and is preparing documentation to comply with requirements of the National Environmental Policy Act (NEPA) of 1969 [42 United States Code (USC) §§ *4321 et seq.*]. NEPA is the "basic national charter for protection of the environment" [40 CFR §1500.1(a)] and requires federal agencies to be fully informed about the environmental consequences of their decision to provide financial assistance, exercise permit or regulatory authority, or to conduct an action that may significantly affect the environment. In addition, NEPA mandates that the public be informed of the proposed actions, the consequences of the actions, and the ultimate agency decision. Based on the size of the project area, the current purpose for the site, and the potential positive and negative environmental effects, both individually and cumulatively, of the anticipated action (the proposed A-1 Shallow FEB), the USACE has determined that the project would "significantly" affect the human environment. Therefore, an Environmental Impact Statement (EIS) is necessary to inform any final decision on the permit application. The USACE's decision will be to either issue, issue with modifications to the applicant's proposal, or deny a DA permit for the proposed action.

This document, the *Everglades Agricultural Area A-1 Shallow Flow Equalization Basin EIS* (A-1 FEB EIS), is an EIS that provides a comprehensive environmental analysis to aid in the decision making process for the DA permit application for the proposed Shallow FEB. The USACE has prepared this EIS in accordance with the Council of Environmental Quality (CEQ) Regulations (40 CFR Parts 1500-1508), 33 CFR Part 325, Appendix B "*National Environmental Policy Act Implementation Procedures for the Regulatory Program*", and 40 CFR §230.10(a), which implement the procedural provisions of the NEPA (42 USC §§4321 et seq.) for the USACE.

The CEQ regulations implementing the NEPA mandate that Federal agencies responsible for preparing NEPA analyses and documentation do so "in cooperation" with other agencies with jurisdiction by law or special expertise (40 CFR §§ 1501.6 & 1508.5). The proposed project would require authorization from the USACE under Section 404 of the CWA and would be subject to U.S. Fish and Wildlife Service (USFWS)/U.S. Department of Interior (DOI) approval for a land use change for construction of a Shallow FEB on the A-1 Project Site. Therefore, the USACE requested that the DOI be a cooperating agency on this EIS, and the DOI agreed on October 30, 2012. Since the USFWS and the U.S Environmental Protection Agency (USEPA) have expertise in threatened or endangered species and water quality, respectively, the USACE has also invited the USFWS and USEPA to be cooperating agencies on this EIS. The USEPA agreed to be a cooperating agency on this EIS on October 16, 2012. The USFWS has assisted the USACE to develop this EIS. Because the authorization from the USACE is the major federal action, the USACE is the lead federal agency for this NEPA process and is responsible for preparation of the EIS.

This particular chapter of the EIS will cover the project background and purpose, and a description of the project as proposed by the SFWMD. This chapter is designed to provide a concise description to the public and to decision makers about what the essential needs and goals are for the project. The project's purpose and need is presented in Section 1.5. Section 1.6 describes the permit decision to be made while Section 1.7 discusses issues raised by the public. Finally, Section 1.8 discusses the environmental documents related to the proposed permit action.

1.3 BACKGROUND INFORMATION

Section 1.3.1 provides background information to describe the history of actions that have focused on managing phosphorus levels in the Everglades Protection Area (EPA) as defined in the 1994 Everglades Forever Act (EFA), including the adoption of the phosphorus Water Quality Based Effluent Limits (WQBEL) for the STAs, and the development of Regional Water Quality Plan. The EPA includes WCA 1, otherwise known as Arthur R. Marshall Loxahatchee National Wildlife Refuge (the Refuge), WCA 2A, 2B, 3A, 3B, and the Everglades National Park. Section 1.3.2 describes the prior permitting history associated with the previously permitted A-1 Reservoir project. Finally, Section 1.3.3 describes the history and need to obtain approval for a land use change on the A-1 project site.

1.3.1 HISTORY OF PHOSPHORUS MANAGEMENT IN THE EVERGLADES

In 1988, the federal government filed a complaint in federal court against the Florida Department of Environmental Protection (FDEP) and SFWMD for alleged violations of state water quality (U.S. v. FDER and SFWMD, Case No. 88-1886-CIV-MORENO). The lawsuit was settled in 1991. In 1992, a Consent Decree was entered embodying the terms of the 1991 settlement agreement. The 1992 Consent Decree identified a number of specific actions the State needed to undertake to address excess phosphorus in discharges from the EAA into the Everglades. These include the development of a regulatory program for implementation of performance-based best management practices (BMPs) to reduce phosphorus in outflows from EAA farms, and creation of the initial 32,600 acres of STAs with 34,700 total acres to be purchased. STAs are shallow marshes constructed and operated to reduce phosphorus levels in surface water entering the EPA. The Consent Decree also included interim and long-term phosphorus concentration limits for inflows to the Everglades National Park (ENP), and ambient phosphorus levels for the Refuge marsh.

In 1994, expanding upon the 1992 Consent Decree, the Florida Legislature enacted the Everglades Forever Act (EFA), which, following the approach identified in the 1992 Consent Decree and the 1994 Everglades Protection Project Conceptual Plan, envisioned a two pronged approach to achieving water quality standards in the EPA. First, the EFA directed the SFWMD to implement a regulatory source control program requiring landowners in the EAA and adjacent C-139 Basin to reduce phosphorus in their runoff prior to discharge. Second, the EFA required the SFWMD to acquire land, then design, permit, and construct an expanded series of STAs to further reduce phosphorus levels in stormwater runoff and other sources before it enters the EPA. In 1995, the settling parties (United States of America, FDEP, and SFWMD) jointly moved to modify the Consent Decree, including the size of and the deadline for completion of STAs, to reflect changed circumstances and the enactment of the EFA by the Florida legislature in 1994. Under the proposed modification, the USACE would have been responsible for construction of STA-1 East which would discharge into the Refuge. The motion to approve those modifications was granted in 2001. In the 1994 EFA, the STAs, also known as the Everglades Construction Project (ECP), originally consisted of six large constructed wetlands totaling about 40,000 acres. The STAs were expanded by approximately 5,000 acres in Fiscal Year (FY) 2007 while in FY2012, completion of construction of Compartments B and C resulted in an additional 12,000 acres of treatment area, for a total of 57,000 acres of effective treatment area. As discussed below, the latest proposed expansion embodied in the 2012 NPDES permit for the STAs will bring the STAs to a total of approximately 63,000 acres and will provide an additional 110,000 acre-feet of additional water storage (SFWMD 2013).

The EFA also required the development of a numeric total phosphorus water quality standard for the EPA by December 31, 2003, or a default standard of 10 parts per billion (ppb) would take effect. Although the default criterion did become effective, it was replaced with the current 10 ppb criterion which includes a four part methodology to measure achievement of the criterion (Rule 62-302.540 F.A.C.). If the STAs and source controls contemplated by the EFA would not achieve water quality standards including the applicable numeric criterion for total phosphorus in the EPA by December 31, 2006, the EFA required the SFWMD to submit a new proposal to the FDEP by December 31, 2003, that would achieve compliance by 2006. In March 2003, the SFWMD developed and submitted the Long-Term Plan for Achieving Water Quality Goals in Everglades Protection Area Tributary Basins (Long-Term Plan) to FDEP, which was incorporated into the EFA by reference (Burns & McDonnell 2003). The Long Term Plan was revised in October 2003. Also in 2003, the Florida legislature amended the EFA requiring the SFWMD to implement the Long-Term Plan in two phases. The initial phase included physical and vegetative enhancements to existing STAs, expanded source control programs in non-ECP basins, and integration with the Comprehensive Everglades Restoration Plan (CERP) projects.

The second phase was to be developed if the elements of the initial phase were unsuccessful in achieving water quality standards in the EPA by 2016.

The STA expansions and enhancements described in the initial phase of the Long-Term Plan have been completed and reductions in phosphorus concentrations have been achieved, but on occasion, concentrations in the Refuge have exceeded levels proscribed in the Consent Decree. Despite the success of these measures state and federal agencies recognize the need to further improve the quality of water entering the Everglades in order to achieve the standards.

In 2004, the Miccosukee Tribe of Indians of Florida (Miccosukee Tribe) and the Friends of the Everglades (FOE) brought suit against the USEPA alleging that the 2003 EFA amendments were new or revised state water quality standards that USEPA should have reviewed and disapproved. The complaint also alleged that USEPA should have reviewed and disapproved parts of the State's phosphorus rule. USEPA already reviewed and approved the numeric criterion and implementing methodology for total phosphorus. After several remands and actions, in July 2008, Judge Alan Gold agreed with the Miccosukee Tribe and FOE and issued an order enjoining FDEP from issuing new NPDES permits for the STAs that authorize discharges above the 10 ppb phosphorus standard. The Judge also ordered USEPA to review and disapprove the amendments to the EFA and to review the remainder of the State's phosphorus rule to determine if it is in compliance with CWA. In December 2009 USEPA issued a new determination disapproving the EFA Amendments as new or revised water quality standards as well as disapproving portions of the phosphorus rule. In response to motions filed by the Miccosukee Tribe and FOE, on April 14, 2010, Judge Gold further ordered USEPA to issue an Amended Determination identifying the remedies and strategies that the SFWMD would need to implement to achieve the 10 ppb phosphorus standard in the EPA. The Court also ordered the State to submit NPDES permits within 60 days of the Amended Determination that conformed to the Court's orders, and the Amended Determination.

1.3.1.1 Restoration Strategy

In response to Judge Gold's April 14, 2010, order, the USEPA began a technical review of the current phosphorus control technologies in order to develop a suite of remedies and strategies to achieve water quality standards in the EPA. USEPA consulted with the SFWMD, FDEP, and others during the development of these remedies and strategies. USEPA first identified a WQBEL for discharges into the EPA that USEPA determined would achieve compliance with the State of Florida's numeric phosphorus criterion in the EPA. USEPA, after months of modeling of various options and discussion, subsequently identified a suite of additional water quality projects based on the modeling that would work in conjunction with the existing Everglades STAs to meet the WQBEL for discharges from those STAs. USEPA's Evaluation of Alternatives to

Achieve Phosphorus WQBELs in Discharges to the Everglades Area dated September 2, 2012, is included in Appendix G.

On September 3, 2010, USEPA issued an Amended Determination (2010 AD) identifying a recommended WQBEL, and a suite of remedies and strategies designed to achieve the WQBEL. The 2010 AD is included in Appendix G.

In particular, the 2010 AD proposed that the A-1 site would be designated as an STA to maximize phosphorus uptake. The size of the STA that the USEPA predicted would be needed to meet the WQBEL was based on many factors and assumptions including the volume of flow to be treated and the concentration of TP in these flows. Based on these assumptions, the modeling predicted a 15,600 acre STA would be needed in the Central Flowpath to meet the WQBEL at the discharge points of STA 2 and STA 3/4. The USEPA noted in the 2010 AD that there may be other project designs that could meet the WQBEL and invited the SFWMD to submit an alternative plan. Since the USEPA issued the 2010 AD, additional permitting developments occurred.

On November 2, 2010, consistent with the Court's April 14, 2010 Order, FDEP submitted example NPDES permits to the Court and indicated that FDEP lacked State law authority to conform to the 2010 AD without compliance schedules. After hearings, the Court issued a subsequent order that deemed these permits as submitted to USEPA as draft permits for review under the CWA. USEPA objected to these permits finding certain provisions, including the use of the compliance schedules, inconsistent with the requirements of the CWA.

In addressing USEPA's objections, the SFWMD began a new analysis of potential remedies, starting with the work done for the Amended Determination. The SFWMD updated and revised some of the flow data and hydrologic modeling upon which the USEPA had relied in developing the projects for the 2010 AD. For example, the SFWMD plan assumed a slightly lower volume of water to be treated, and relied upon different assumptions regarding TP concentrations in the water to be treated. Both the 2010 AD and the SFWMD plan relied on the use of the 15,000 acre A-1 site to store or treat water. However, the revised SFWMD plan would utilize the A-1 site as a 54,000 acre-foot FEB to manage and meter water flow and phosphorus load discharged into STA 2 and STA 3/4. Even though the FEB was not designed to treat phosphorus, water depth in the Shallow FEB is projected by the State to support vegetation that is likely to aid in the removal of additional phosphorus.

The new modeling relied data and information and options different than those relied upon by the USEPA at the time of the 2010 AD. After extensive technical discussions with the SFWMD and the FDEP and thorough evaluation, the USEPA concluded that the State plan is based on an appropriate set of assumptions given the information available at the time the plan was developed. The USEPA determined that the State plan can reasonably be expected to achieve the WQBEL.

The USEPA worked closely with other federal agencies, the SFWMD, and the FDEP to identify a modified suite of remedies that was based on many months of additional modeling by the SFWMD, ENP and the Refuge. Ultimately, these new remedies were incorporated into a draft National Pollutant Discharge Elimination System (NPDES) permit and consent order, along with an EFA permit and consent order, issued by FDEP on June 6, 2012. Historically, each STA had an individual permit. It was decided to issue one watershed NPDES permit for all the STAs. The 2012 revised NPDES watershed permit, associate documents and draft enforcement consent order between the FDEP and the SFWMD include corrective actions and deadlines to achieve the WQBEL. These documents are in Appendix G and can be found online at the website: http://www.dep.state.fl.us/water/wqssp/everglades/ecp-sta.htm.

USEPA found the permit addressed its objections, which led to final NPDES permit being issued on September 10, 2012. The permit established a WQBEL and identified a suite of additional water quality improvement projects developed by the State (in lieu of those in the Amended Determination), identified as the Regional Water Quality Plan (RWQP).

This EIS, although independent from the evaluation performed by the USEPA in the Amended Determination and subsequent evaluation associated with the 2012 NPDES permit recognizes the prior discussions between the USEPA, SFWMD and FDEP. This is also reflected in USEPA's memorandum reviewing the State's proposal, entitled, "Assessment of the State of Florida's Everglades Water Quality Plan," dated June 13, 2012.

1.3.1.2 Water Quality Based Effluent Limit

The WQBEL is a numeric discharge limit that will be applied to all NPDES permitted discharges from Everglades STAs to the EPA to assure that such discharges do not cause or contribute to exceedances of the 10 ppb total phosphorus (TP) criterion [expressed as a long-term geometric mean (LTGM)] established under 62-302.540, Florida Administrative Code (F.A.C.) (SFWMD – Final Technical Support Document for the WQBEL 2012). TP is measured at a network of stations across the EPA marsh and prevents imbalances of aquatic flora and fauna. The WQBEL is measured at the discharge points from each STA and requires that total phosphorus concentration in STA discharges shall not exceed: 1) 13 ppb as an annual flow-weighted mean in more than three out of five water years on a rolling basis; and 2) 19 ppb as an annual flow-weighted mean in any water year.

1.3.1.3 Regional Water Quality Plan

The RWQP was the result of many months of discussions and modeling by both the State of Florida and ENP and the Refuge, and is composed of projects divided into the three EAA flow paths (Eastern, Central and Western) (**Figure 1-2**). Under the RWQP, the proposed Shallow FEB project, a component of the Central Flowpath, is an incremental step towards achieving the overall goal of meeting water quality standards in the EPA. The Shallow FEB is the subject of this EIS. Other projects identified in the RWQP will be evaluated as appropriate for those projects requiring DA authorization under the CWA.

1.3.2 PRIOR DEPARTMENT OF THE ARMY PERMITS

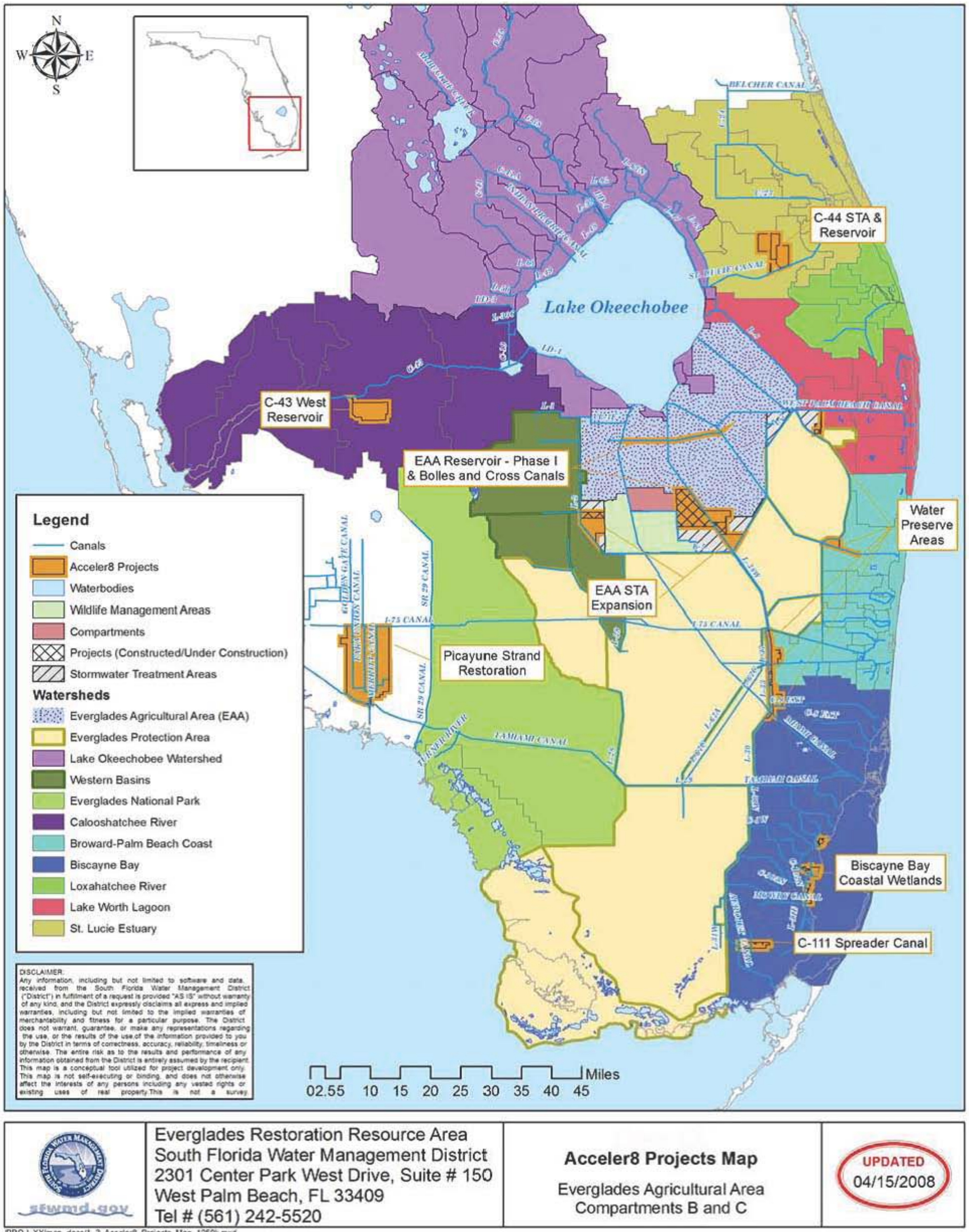
On October 14, 2004, (after passage of the EFA and before Judge Gold's decision) a Memorandum of Agreement (MOA) regarding acceleration of several CERP and other water quality improvement projects was signed by the Governor's Executive Office and the SFWMD. Collectively the group of projects was named Acceler8. Acceler8, consisting of eight projects with multiple components (**Figure 1-4**), was designed to expedite attainment of water quality, quantity, timing and delivery goals of Everglades restoration efforts ahead of the federal implementation schedule for CERP. The eight Acceler8 projects include:

- C-44 (St. Lucie Canal) Reservoir / Stormwater Treatment Area
- C-43 (Caloosahatchee River) West Reservoir
- Everglades Agricultural Area STA Expansion
- Everglades Agricultural Area Storage Reservoir- Phase 1 (later phase to include Bolles and Cross Canals Improvements)
- Water Preserve Areas Includes Site 1, C-9, C-11, Acme Basin B, Water Conservation Area-3A/3B Seepage Management Area
- Picayune Strand (Southern Golden Gate Estates) Restoration
- Biscayne Bay Coastal Wetlands - Phase 1
- C-111 Spreader Canal

As part of the Acceler8 program, the SFWMD pursued construction of a 12.5-foot deep reservoir on the A-1 project site for water storage ahead of the federal schedule for implementation of a CERP reservoir project at that site. The 12.5-foot deep reservoir was to be the Everglades Agricultural Area Reservoir – Phase 1 (fourth bullet above) project, also referred to as the A-1 Reservoir. As described in the 2006 Final EIS for the EAA A-1 Reservoir, the overall project purpose of the reservoir was to provide water storage in order to improve timing of water deliveries from the EAA to the WCAs, reduce Lake Okeechobee regulatory releases to the estuaries (i.e. route additional water from the lake south thereby reducing discharges to the estuaries), meet supplemental agricultural irrigation demands, and increase flood protection within the EAA. The purpose of the A-1 Reservoir and the current project differ (e.g. the current project does not propose to route additional water from the lake south that would otherwise go to tide or to meet supplemental agricultural demands). Additional information on the current proposal's purpose and need is provided in Section 1.5. A DA permit was issued to the SFWMD associated with the construction of the 190,000 acre-foot A-1 Reservoir in July 2006. The SFWMD began construction on the EAA A-1 Reservoir in 2006, but terminated the construction contract in late 2008. Subsequently, in 2008 the State of Florida announced the River of Grass proposal to purchase additional lands in the EAA and C-139 Annex from the U.S. Sugar Corporation. The SFWMD recognized that the acquisition of additional lands could lead to modifications of the plan for the A-1 Reservoir beyond what was contemplated by the expedited project. The DA permit for the A-1 Reservoir has since expired.

The SFWMD having terminated the plans for the reservoir, is now proposing to construct a Shallow FEB (up to 4 feet of surface water) on the A-1 project site (**Figure 1-5**). The purpose of this project is not to be confused with purpose of the A-1 Reservoir as the project purposes are quite different. The main difference is that the A-1 Reservoir project purpose was to reduce Lake Okeechobee regulatory releases to the estuaries (i.e. to route additional water from the lake south thereby reducing discharges to the estuaries) and provide water storage for other uses, while this project would only attenuate the flow of existing water into the STAs to maximize water quality treatment for existing water, that is water currently sent south from Lake Okeechobee (does not accept water releases that would have otherwise been sent to the estuaries). To construct the Shallow FEB, a new DA permit will be required to fill waters of the US, including wetlands.

Figure 1-4 Acceler8 Projects



1.3.3 TALISMAN LAND ACQUISITION

The need to obtain an interim land use change approval from the USFWS/DOI for construction of the Shallow FEB on the A-1 project site is a requirement of the funding agreement entitled *Cooperative Agreement Among the United States Department of the Interior and the Nature Conservancy and the South Florida Water Management District* (Cooperative Agreement). Congress enacted the 1996 Federal Agriculture Improvement and Reform Act (Farm Bill) and provided funds on April 4, 1996 (Public Law 104-127, 110 Statute 1022). Under Section 390 of the Farm Bill, the Secretary of Interior was authorized to use funds made available to conduct restoration activities in the Everglades ecosystem in South Florida, including, but not limited to the acquisition of real property and interests in real property located within the Everglades ecosystem. The Farm Bill provided that the Secretary of the Interior could transfer funds to the USACE, the State of Florida, or the SFWMD to conduct the aforementioned restoration activities.

A Framework Agreement was entered between the DOI, the Department of the Army, the State of Florida, FDEP and the SFWMD, on October 3, 1996, which provides a framework for the Secretary of Interior to provide funds under Section 390 to the other parties for Everglades ecosystem restoration. The parties agreed to use Section 390 funds, in part, to acquire real property for conservation purposes and to construct features that are intended to become part of existing or future USACE projects authorized by Congress. The parties agreed, consistent with the Farm Bill, to use Section 390 funds, in part, to acquire real property for conservation purposes and to construct features that are intended to become part of existing or future USACE projects authorized by Congress. The parties agreed, consistent with the Farm Bill, that any real property acquired or features constructed with these funds will be used to conduct restoration activities in the Everglades ecosystem. The Framework Agreement also provides that funding agreements between DOI, FDEP, and the SFWMD generally will use the standard forms and follow the standard procedures of the USFWS pertaining to the provision of funds including grants or cooperative agreements, whichever the case may be.

The Framework Agreement specifically provides that real property acquired may be managed for purposes that are not inconsistent with the purpose of restoring the Everglades ecosystem until the land is intended to be incorporated into a DA project. In addition, the Framework Agreement provides a dispute resolution mechanism.

In 1999, the Nature Conservancy under the terms of the Cooperative Agreement closed on the acquisition of approximately 50,000 acres of land located within the southern portion of the

EAA in Palm Beach and Hendry Counties. This acquisition, which included the Compartment A-1 lands, was the culmination of many years of negotiations.

The DOI transferred funds to the Nature Conservancy pursuant to the Cooperative Agreement, and the SFWMD received the title to the properties acquired. The Cooperative Agreement states that lands acquired for public ownership under this Agreement will be used and managed for purposes of Everglades ecosystem restoration and will be subject to the provisions of the Framework Agreement, including but not limited to, those provisions applicable to uses of property prior to the commencement of the USACE project. Any proposed change in land use of Compartment A-1 may not be implemented until the USFWS/DOI: 1) reviews the proposal; 2) determines that it meets the requirements of the NEPA, Section 7 of the Endangered Species Act (ESA), Section 106 of the National Historic Preservation Act, and any other applicable statutes; and 3) approves the proposal. The Cooperative Agreement also includes a procedure for dispute resolution.

It is essential to Everglades restoration that water entering the WCAs achieves the WQBEL and flows entering ENP meet the limits set in the phosphorus rule which are also the limits identified in the 1992 Consent Decree, Appendix A for ENP. During the evaluation and optimization for the A-1 project site the SFWMD determined a Shallow FEB would optimize the treatment performance of the existing STA's and be more cost effective than a deep FEB, or reservoir.

1.4 DESCRIPTION OF PROPOSED ACTION

The proposed Shallow FEB is a shallow above-ground impoundment for the temporary storage of stormwater runoff, with a capacity of approximately 60,000 acre-feet at an approximate maximum operating depth of 4 feet (**Figure 1-5**). As a result of the project, approximately 435.9 acres of waters of the US, including wetlands, would be impacted as a result of placement of fill and approximately 10,500 acres of waters of the US would be inundated (up to four feet of water depth).

The key features of the Shallow FEB project include the following:

- Approximately 60,000 acre-foot impoundment with a perimeter levee and seepage collection canals
- Gated inflow structures
- Inflow conveyance channels and interior levees
- Outflow collection and conveyance canal
- Gated outflow structures

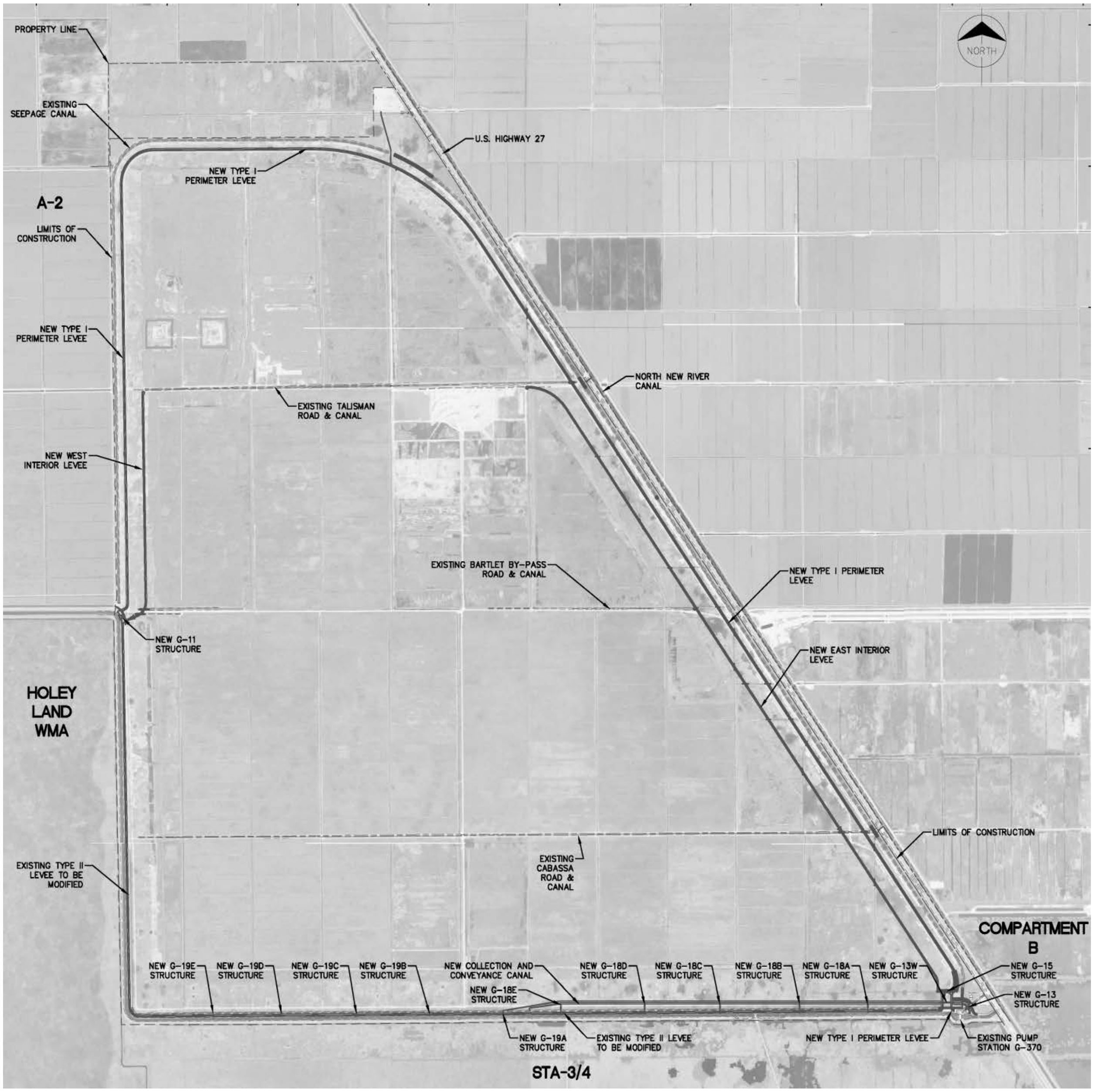
The proposed Shallow FEB is intended to attenuate peak water flows and temporarily store excess water from within the central EAA, collected by the North New River and Miami Canals and to subsequently improve inflow delivery rates to STA 2 (including Compartment B) and STA 3/4. By managing basin runoff in the Central Flowpath in a more advantageous manner, the impacts of storm driven events would be reduced for STA 2 and STA 3/4. The proposed Shallow FEB will also improve operations of the STAs in the dry season by providing water during the periods of drought and low water conditions. Attenuating and managing excess water flows in the Central Flowpath will enhance operations and improve phosphorus treatment performance in STA 2 and STA 3/4 so that these STA discharges meet the WQBEL. Discharges from these STAs flow into WCA 2A and WCA 3A, part of the EPA marsh where the 10 ppb phosphorus criterion is applied.

The goals and objectives for the Shallow FEB are to assist STA 2 and 3/4 in achieving the WQBEL at the STA discharge. The FEB will facilitate this in concert with the STAs in three ways:

1. Attenuate peak water flows and temporarily store runoff from the central EAA, thereby minimizing the discharge of untreated water into the EPA
2. Improve inflow delivery rates to STA 2 and STA 3/4, thereby providing enhanced operation and phosphorus treatment performance
3. Assist in maintaining minimum water levels and reducing the frequency of dryout conditions within STA 2 and STA 3/4, which will sustain phosphorus treatment performance

Although the 2012 Consent Order requires that construction commence by June 2014 and be completed by July 2016, the SFWMD is proposing to move forward on an accelerated basis. The SFWMD anticipates that construction would begin in October 2013 and be completed by March 2015. The Consent Order requires that 54,000 acre-feet of storage capacity be constructed. Since the A-1 project site could support 60,000 acre-feet of storage, the SFWMD has chosen to utilize the maximum storage on the site.

Figure 1-5 A-1 Shallow FEB Features



1.5 PROJECT PURPOSE AND NEED

In accordance with the NEPA, an EIS "shall briefly specify the underlying purpose and need to which the agency is responding" (40 CFR §1502.13). When considered together, the "purpose" and the "need" for the project establish the basic parameters for identifying the range of alternatives to be considered in an EIS. Under NEPA (33 CFR Part 325, Appendix B) and under Section 404 of the CWA pursuant to the Section 404(b)(1) Guidelines (40 CFR Part 230), there are three ways that the USACE is to examine the underlying goals, or purpose, of a project: 1) the Applicant's stated purpose and need (i.e. SFWMD's stated purpose and need), 2) a "basic" project purpose defined by the USACE specifically for addressing a project's water dependency, and 3) an "overall" project purpose, which is defined by the USACE and is used for the alternatives analysis. Pursuant to 33 CFR Part 325, Appendix B, when defining the purpose and need for a project, "while generally focusing on the applicant's statement, the USACE will in all cases, exercise independent judgment in defining the purpose and need for the project from both from the applicant's and the public's perspective."

Interpreting the Applicant's Stated Purpose and Need. The Applicant's stated purpose and need is an expression, typically in the Applicant's own words, of the underlying goals for a proposed project. The USACE takes an applicant's purpose and need into account when determining the overall purpose and the project purpose and need. The Applicant's purpose and need is described in Section 1.5.1 below.

Defining the USACE's Basic Project Purpose. The USACE uses the basic project purpose to determine water dependency [40 CFR §230.10(a)(3)]. If a project is not water dependent, other alternatives that would not result in impacts to *special aquatic sites* are presumed to be available. The Section 404(b)(1) Guidelines state that practicable alternatives to nonwater-dependent activities are presumed to be available and to result in less environmental loss unless clearly demonstrated otherwise by the applicant [40 CFR §230.10 (a)(3)]. Section 1.5.2.1 below defines the USACE's basic project purpose as applied to the Applicant's proposed project.

The Section 404(b)(1) Guidelines are one of the substantive criteria that the USACE uses to evaluate a permit. The Section 404(b)(1) Guidelines establish two rebuttable presumptions: first, for a non-water-dependant project, the Guidelines presume that practicable alternatives are available that do not involve the discharge of dredged or fill material into a special aquatic site, such as wetlands. Second, the Guidelines presume that such alternatives result in less adverse impact on the aquatic ecosystem than wetland alternatives. These presumptions apply unless the applicant clearly demonstrates otherwise. Application of these rebuttable presumptions results in the identification of the least environmentally damaging practicable alternative (LEDPA).

Defining the USACE's Overall Project Purpose. The USACE will use the overall project purpose to identify alternatives for evaluation in this EIS and to determine if the Applicant's proposed project is the LEDPA under the Section 404(b)(1) Guidelines. According to USACE guidance in its 2009 Standard Operating Procedures, "The overall project purpose should be specific enough to define the applicant's needs, but not so restrictive as to constrain the range of alternatives that must be considered under the Section 404(b)(1) Guidelines. Defining the overall project purpose is the USACE's responsibility. However, the applicant's needs and the type of project being proposed should be considered." The USACE's overall project purpose more specifically addresses the Applicant's purpose and need than does the USACE basic project purpose. The USACE's overall project purpose, as applied to the Applicant's proposed project, is defined in Section 1.5.2.2 below.

Defining the USFWS/DOI's Project Purpose and Need. The project purpose as defined by USFWS/DOI is to conduct restoration activities in the Everglades ecosystem. Because the Compartment A lands were acquired for public ownership under the Cooperative Agreement and are intended to be used and managed for purposes of Everglades Ecosystem Restoration subject to the provisions of the Cooperative Agreement, any proposed change in land use of Compartment A-1 may not be implemented until the USFWS/DOI approves the proposal. Therefore, for purposes of this EIS, the USFWS/DOI must determine that the Proposed Action constitutes conducting restoration activities in the Everglades ecosystem in order to approve the interim land use change for construction of the Shallow FEB.

1.5.1 THE APPLICANT'S PURPOSE AND NEED STATEMENT

The Applicant's stated purpose and need is a statement that defines the intent and underlying goals for a proposed project. The Applicant's stated purpose and need are as follows:

The SFWMD's purpose of the project is to improve inflow delivery rates to STA 2 and STA 3/4 by attenuating peak water flows and temporarily storing water runoff primarily from the central EAA, and to assist in maintaining minimum water levels and reducing the frequency of dryout conditions within STA 2 and STA 3/4, which would increase the phosphorus treatment performance of these STAs in order to achieve the WQBEL.

The RWQP identified that an FEB was needed to improve management of flows in the Central Flow Path. The Central Flow Path is primarily comprised of flows from the S-2/S-6/S-7 and S-3/S-8 drainage basins, South Florida Conservancy District, and South Shore Drainage District with a small amount of water coming from the C-139 Basin and Lake Okeechobee regulatory releases under limited conditions. An FEB in this location within the EAA can manage basin runoff in the Central Flowpath in a more advantageous manner than the no action alternative, thereby reducing the impacts of storm driven events and dry-outs on STA 2 and STA 3/4 phosphorus reduction performance in order to assist these STAs in meeting the WQBEL.

1.5.2 USACE PROJECT PURPOSE AND NEED STATEMENT

As stated above, the USACE defines the basic project purpose to determine water dependency while the overall project purpose is used to identify and evaluate alternatives, including the LEDPA.

1.5.2.1 USACE Basic Project Purpose and Water Dependency

The basic project purpose is to improve water quality of flows from the STAs 2 and 3/4. In general, improvement of water quality or water treatment does not require access or proximity to a special aquatic site. Therefore, the USACE finds that the basic project purpose is not water dependent.

The A-1 project site is located in an area which consists of agricultural areas as well as wetlands and ditches (or other Waters of the US). The need to attenuate water and then deliver it to the STAs located at the south of the central flow path will ultimately limit the location of any alternative sites of comparable size that could be utilized to satisfy the project purpose. Additionally, other project sites within the Central Flowpath would have similar site characteristics as the entire EAA has similar characteristics. Therefore, limited practicable alternatives exist that would not have a similar impact on special aquatic sites and none of these would be able to deliver water to the STA 3/4 and STA 2 as needed to improve performance. The USACE may authorize the discharge of dredged or fill material into waters of the US for a proposed project that is not water dependent if the USACE determines that the proposed project: (1) is the LEDPA and complies with other Section 404(b)(1) Guideline requirements, (2) is not contrary to the public interest, and (3) complies with all other applicable regulatory requirements.

The USACE determined that the DA permit application for the proposed Shallow FEB is a single and complete project as defined in 33 CFR §330.2(i). While the Regional Water Quality Plan envisions multiple projects in three separate flow paths from the EAA into the Everglades, the A-1 FEB project is the component of the Central Flowpath and has independent utility.

1.5.2.2 USACE Overall Project Purpose

The overall project purpose, as defined by the USACE, is to achieve the WQBEL at the STA 2 and STA 3/4 discharge points in the Central Flowpath of the Everglades Protection Area.

1.5.3 DOI PROJECT PURPOSE AND NEED STATEMENT

The purpose and need statement for the required USFWS/DOI interim land use change is to conduct restoration activities within the Everglades ecosystem. Concurrent with the analysis conducted by the USACE in this EIS, in order for approval of the interim land use change for construction of the Shallow FEB, USFWS/DOI also must determine that the proposed action constitutes restoration activities in the Everglades ecosystem.

1.6 DECISIONS TO BE MADE

The Proposed Action would result in the discharge of dredged or fill material into waters of the US, including wetlands, through filling, excavation, land clearing, and other activities. Under Section 404 of the CWA (33 USC §1344), the USACE is responsible for regulating the placement of fill and discharge of dredged material into the waters of the US, including wetlands. Therefore, because the SFWMD is seeking approval of a permit from the USACE, a federal agency, the project involves a federal action. Because any environmental consequences of SFWMD's proposed project are essentially products of the USACE permit action, the scope of the federal permitting action includes all of construction activities associated with this action on the project site. Based on review of this EIS, the USACE will make a decision to either issue, issue with conditions, or deny a permit for the Proposed Action.

The Proposed Action, through the USACE permit review requires consultation under Section 7 of the ESA and Section 106 of the National Historic Preservation Act. Additionally, the Proposed Action would involve evaluation for compliance with the Section 404 (b)(1) Guidelines of the CWA; Section 401 of the CWA, the Clean Air Act, and federal requirements under the 1996 Farm Bill Act. A draft of the Section 404(b)(1) Guidelines evaluation is included in Appendix A, the final evaluation will be provided in a Record of Decision that documents the DA permit decision after completion of the Final EIS. Other authorizations required may include: a Water Quality Certification issued pursuant to Section 401 of the CWA through the FDEP; a Coastal Zone Management Act consistency determination under Section 307 issued by FDEP; an EFA permit from FDEP; a Conceptual Reclamation Plan issued by the FDEP; and a Zoning and Land Use Permit issued by the appropriate county. If the STA is selected as the preferred alternative, a National Pollution Discharge Elimination System permit for construction and operation of an STA may also be required. Consultation and coordination, including public involvement, are included in Chapter 7 of this EIS while a description of the required permits, licenses and environmental laws are described in Chapter 8.

1.7 PUBLIC INVOLVEMENT

One of the basic tenets of NEPA is that comprehensive information is made available to the public and agency officials before decisions are made and before actions are taken. In addition, NEPA gives all persons, organizations, and government agencies the right to comment on proposed federal actions that are evaluated by an EIS. To provide the public with the comprehensive information they need to comment, the early identification of issues and potential impacts is critical to efficient, effective EIS preparation. To obtain public input for this Final EIS and to ensure that the information provided in the Final EIS was comprehensive, the USACE sought input both early in the process, as required by NEPA, and throughout the development of this document. The opportunities for public input available during the EIS development are summarized in the following paragraphs.

1.7.1 SCOPING SUMMARY

The scoping process helps to establish the framework for the environmental study and facilitates the development of the reasonable range of feasible alternatives to be evaluated in the EIS. The goal of scoping is to provide opportunities for the public and agencies to provide input on the proposed project. The lead federal agency uses scoping comments to identify the nature and extent of potential issues and impacts.

To solicit public comments and develop a range of alternatives, the USACE held a public scoping meeting, published the intent to complete an EIS in the Federal Register, distributed a public notice, conducted a press release to media outlets, and consulted with agencies and federally recognized Native American Tribes letters by mail. The USACE generated a mailing list of interested parties which includes parties that had previously been involved with the A-1 Reservoir mailing list, a list of parties generated by the FDEP for the watershed NPDES permit for the STAs parties on the distribution list for the Central Everglades Planning Project (CEPP) and the River of Grass project, and parties interested in the EAA, as well as adjacent landowners, State, Federal, and local governments. Approximately eighteen (18) people attended the Scoping meeting which was held on September 6, 2012, at the SFWMD Auditorium, 3300 Gun Club Road, West Palm Beach, Florida.

During the formal scoping period from August 28, 2012, to September 27, 2012, fourteen (14) issue-specific comments were identified in the communication received from the public and agencies. In general, comments received were related to one or more of the following nine (9) major categories:

- general support for the project,
- potential for improved habitat,
- water quality,
- fish and wildlife resources,
- the interrelationship with the federal Central Everglades project,
- wetland mitigation and a contingency plan,
- effects of operation,
- alternative analysis, and
- downstream water quantity.

Scoping comments were used in conjunction with the USACE defined overall project purpose to develop the full range of alternatives presented in Chapter 2. Specific public and agency input received during scoping was used to inform the scope and range of issues addressed. This input included:

- geographic extent of the affected environment,
- evaluation of the deep FEB, or reservoir, as an alternative.

1.7.2 ISSUES ELIMINATED FROM DETAILED ANALYSIS

The following issues were eliminated from detailed analysis based on public and internal scoping:

- **Essential Fish Habitat** – Since the proposed project would not change the amount of freshwater that currently is released from Lake Okeechobee to tide, the project would not affect essential fish habitat in the St. Lucie and Caloosahatchee estuaries.
- **Air Quality** – Although a new pump station would be required for the deep FEB and the STA alternatives, no measurable changes in air quality are expected to occur as a result of any of the alternatives. There may be a negligible impact on carbon monoxide emissions within the project area as the pumps are expected to be standard flood control diesel pump stations similar to those at G-370 and G-372. Short term increases would be associated with earth-moving equipment and activities required to accomplish the proposed construction activities, but those short-term impacts will be intermittent in nature and likely offset by the cessation in use of agricultural equipment. Alternatives 2, 3, and 4 require exotic plant removal, which is anticipated to occur by burning. The

increase in air quality pollution associated with the vegetation burning is short term. Long-term effects are associated with the operation of the existing pumps. However, it is anticipated that there would be slight long-term improvements in air quality due to the changes in land use from agricultural to uses such as water storage and native wetland habitats.

- **Noise Pollution -** No measurable changes in noise are expected to occur as a result of any of the alternatives. Noise impacts are expected during construction activities; however, this would be temporary in nature and limited to the immediate area of construction. The long-term noise impacts are associated with the operation of the existing pumps, which is not expected to cause concerns for humans or fish and wildlife species.
- **Transportation** – Any effect on highways from construction traffic would be short term and would not cause extended delays on adjacent highways. These impacts could be considered negligible considering the scope of construction work. Railways that exist in the EAA to transport sugar cane and the mainline railroad, South Central Florida Express, are not anticipated to be affected by Action Alternatives based on their distance from project site.
- **Water Supply and Drinking Water** - The project purpose does not involve increasing or decreasing system performance for water supply or drinking water.

1.7.3 PUBLIC COMMENTS ON THE DRAFT EIS

Once the *Draft A-1 Shallow FEB EIS* was completed, regulations required that it be issued publicly to obtain the comments of (1) any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved or that is authorized to develop and enforce environmental standards; (2) appropriate State and local agencies; (3) American Indian Tribal Governments, when the effects may be on a reservation; and (4) the public, which consists of those persons or organizations who may be interested or affected (40 CFR 1503.1). This section summarizes the public comment period process relating to the release of the *Draft A-1 Shallow FEB EIS* and the major comments raised by the public.

A Notice of Availability for the *Draft A-1 Shallow FEB EIS* was issued on February 22, 2013 (ER-FRL-9007-8; see Appendix D). The formal public comment period began on February 22, 2013, and ended April 8, 2013. In addition, Federal agencies, State and local governmental entities, American Indian Tribal Governments, and the general public were encouraged to submit comments via U.S. mail, e-mail, Facebook, and Twitter.

Eleven (11) comment letters were received on the *Draft A-1 Shallow FEB EIS.* Comments were received from (1) Federal agencies, including USEPA and the U.S. Department of the Interior; (2)

State government offices, including the State Historic Preservation Officer, Florida State Clearinghouse, and the SFWMD; (3) the Seminole Tribe of Florida; (4) non-governmental organizations, including Florida Power and Light, Florida Panther Conservation Bank, and Everglades Foundation; and (5) private individuals. The USACE considered all comments in evaluating the accuracy and adequacy of the draft EIS to determine whether its text needed to be corrected, clarified, or otherwise revised. The content of all comments was examined and summarized into major comment categories, and responses were developed for each of these categories, as appropriate. This summary is provided as Appendix F of this Final EIS along with copies of the comments received. Several topics raised by public comments on the *Draft A-1 Shallow FEB EIS* are of broad interest or concern. These issues are addressed throughout the Final EIS and are more fully responded to in the "Comment/Response Document," Appendix F.

- Federally-listed threatened or endangered species updated
- State-listed species updated
- Wetland impact acreages updated
- Unified Mitigation Assessment Method scores revised to incorporate suggestions
- Environmental Justice communities identified
- Clarifiation to the Settlement Agreement and Consent Decree
- Clarification on required Everglades Forever Act permits
- Clarification on the Recreational Plan
- Incorporated design improvements to improve wildlife habitat within the project footprint
- Updates to include the consultations letters with the Native American Indian Tribes
- Clarification that the project purpose would not accept additional water deliveries from Lake Okeechobee
- Clarification on the relationship with CEPP
- Edits to the Section describing the Seminole Tribe of Florida's Water Rights Compact
- Request to describe the cumulative impacts of the Seminole Tribe of Florida's water needs, entitlements, and customaryusage rights.
- Alternatives analysis to include an laternatve that evaluates accepting new water
- Request to complete a savings clause analysis
- Evaluation of water flows into the Big Cypress Seminole Indian Reservation and the Big Cypress National preserve and its Addition lands.
- Evaluation of potential impacts to downstream cultural resources.
- Wetland jurisdication for prior agricultural lands

1.8 RELATED ENVIRONMENTAL DOCUMENTS

A number of previously published environmental documents contain information relevant to this EIS. Brief summaries of some of the most relevant environmental documents are provided in the following paragraphs. The reports and documents listed below were utilized to varying degrees as sources of information to evaluate the proposed project and have helped to inform the USACE as it developed this EIS on construction and operation of the Shallow FEB.

1.8.1 FINAL EIS – EVERGLADES AGRICULTURAL AREA RESERVOIR A-1

This EIS, which was completed in 2006, is the USACE's NEPA document for the decision to construct a reservoir on the project site. Even though the purpose of the previously permitted reservoir is different from the purpose of the proposed Shallow FEB, much of the information to develop the alternative to construct a Deep FEB, or reservoir on the project site was based on the 2006 EIS. In addition, background information and descriptions of the affected environment were derived from the 2006 EIS.

1.8.2 FINAL EIS TO CONSTRUCT STORMWATER TREATMENT AREAS ON COMPARTMENT B AND C OF THE EVERGLADES AGRICULTURAL AREA, FLORIDA

The USACE completed an EIS in January 2009 for the construction of three additional STAs in the EAA. Two of the three additional STAs include the Compartment B North Build-out and Compartment B South Build-out, which expanded STA 2. The third additional STA is Compartment C, which is located west of the Rotenberger Wildlife Management Area in Hendry County and is part of the STA 5/6 complex. Because the proposed Shallow FEB is intended to assist STA 2, the Compartment B and C EIS was used as a source of reference material since Compartment B expanded the treatment capacity of STA 2. Information in the Compartment B and C EIS was used to help develop background information, to update information needed to describe the affected environment, and to support the technical information used to evaluate the environmental effects.

1.8.3 SOUTH FLORIDA ENVIRONMENTAL REPORT

The South Florida Environmental Report (SFER) is an annual document that consolidates the scientific and engineering efforts made by various agencies throughout south Florida related to Everglades Restoration. As a requirement of the 1994 EFA, the SFWMD, in cooperation with the FDEP, compiles various agencies' reports into a single document to summarize and update the accomplishments on South Florida's environmental restoration and other key activities.

The final SFER of 2012 and draft report of 2013 were used to provide information in the EIS on the existing STAs and water quality data.

1.8.4 FINAL SUPPLEMENTAL EIS FOR THE LAKE OKEECHOBEE REGULATION SCHEDULE 2008

The Lake Okeechobee Regulation Schedule (LORS) 2008 is included in the modeling assumptions for the proposed project. LORS 2008 is an operating schedule for Lake Okeechobee that balances competing water use objectives including flood control, water supply, navigation, and enhancement of fish and wildlife resources. LORS lessened some of the impacts to the environment from the previous regulation schedule (referred to as Water Supply and Environment) by operating the lake at a lower level, and accommodated for the Herbert Hoover Dike structural limitations. A final Supplemental EIS was completed in November 2007 and a ROD was signed in April 2008.

1.8.5 EVERGLADES RESTORATION TRANSITION PLAN

The Everglades Restoration Transition Plan (ERTP) is the water management operating criteria for Central and Southern Florida Project features and the constructed features of the Modified Water Deliveries and Canal-111, which was recently adopted. The ERTP is a modification of the Interim Operational Plan to incorporate operational flexibilities designed to improve hydrological conditions in WCA 3A for the endangered Everglade snail kite, endangered wood stork, and wading bird species while maintaining protection for the endangered Cape Sable seaside sparrow. An EIS was completed for the project, and the Record of Decision was signed on October 19, 2012.

1.8.6 WATER CONSERVATION AREA 3 DECOMPARTMENTALIZATION & SHEET FLOW ENHANCEMENT

Water Conservation Area 3 Decompartmentalization and Sheet Flow Enhancement report, which was completed in May 2007, documents the historical, hydrologic, meteorological and water quality data for WCA 3A and the surrounding area. The document was used to compile existing or baseline conditions of WCA 3A and existing water flows from WCA 3A and 3B.

1.8.7 CENTRAL AND SOUTHERN FLORIDA PROJECT COMPREHENSIVE EVERGLADES RESTORATION PLAN – WATER CONSERVATION AREA 3 DECOMPARTMENTALIZATION AND SHEETFLOW ENHANCEMENT FEASIBILITY SCOPING MEETING REPORT

Decompartmentalization and Sheetflow Enhancement of WCA 3 (Decomp) is a part of the CERP recommended in the 1999 Central and Southern Florida Project Comprehensive Review Study (also known as the Restudy or Yellow Book). The April 2008 report was used to describe the ecosystem in WCA 3A and 3B, which supported the existing site conditions for fish and wildlife habitats, wildlife usage, water flows, water quality, water management, and hydrology.

1.8.8 USEPA AMENDED DETERMINATION AND ASSESSMENT OF THE STATE OF FLORIDA'S EVERGLADES WATER QUALITY PLAN

On September 3, 2010, the USEPA issued its Amended Determination in order to ensure that the water entering the EPA from the EAA and C-139 Basin meets the pertinent water quality standards in the shortest time possible. On June 13, 2012 USEPA issued a memorandum entitled, "Assessment of the State of Florida's Everglades Water Quality Plan." This memorandum documents the history and evolution of the efforts by USEPA, FDEP, and SFWMD since the issuance of the Amended Determination to define the pertinent water quality standards and the means for achieving them. These documents are discussed in further detail in section 1.3.1.1.

1.8.9 NPDES AND EFA PERMITS

On June 13, 2012, FDEP received notification from the USEPA that the permit and associated projects the FDEP submitted on June 6, 2012, addressed USEPA's objections and were sufficient to achieve the phosphorous standard for the EPA. On June 20, 2012, FDEP issued a Notice of Draft Permit for both the Everglades Forever Act watershed permit and proposed consent order and the NPDES watershed permit and proposed consent order for the operation and maintenance of the ECP STAs. The FDEP issued signed permits on September 10, 2012. These permits address all of the STAs, including 2 and 3/4. The NPDES permit number for the STAs is FL0778451 while the EFA permit number is 0311207.

1.8.10 CENTRAL AND SOUTHERN FLORIDA PROEJCT COMPREHENSIVE REVIEW STUDY FINAL INTEGRATED FEASIBILITY REPORT AND PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

The Central and Southern Florida (C&SF) project Comprehensive Review Study, known as the Restudy, re-examines the C&SF Project to determine the feasibility of modifying the project to restore the south Florida ecosystem and to provide for the other water-related needs of the region. The Restudy, dated April 1999, investigated potential structural or operational modifications to the C&SF Project for improving the quality of the environment; protecting water quality in the south Florida ecosystem; improving protection of the aquifer; improving the integrity, capacity, and conservation of urban and agricultural water supplies; and improving other water-related purposes.

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CHAPTER 2

ALTERNATIVES

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2.0 ALTERNATIVES

This chapter outlines the process used to determine the range of reasonable alternatives to the proposed action and presents each alternative to be considered. Several alternatives to the Applicant's proposal were evaluated for their ability to meet the overall project purpose as presented in Chapter 1, including the feasibility, timeliness, and responsiveness to the issues and concerns identified during public scoping. This evaluation process concluded with a range of reasonable project alternatives, including:

- Alternative 1: No Action
- Alternative 2: Shallow Flow Equalization Basin (Applicant's Proposed Action)
- Alternative 3: Deep Flow Equalization Basin
- Alternative 4: Stormwater Treatment Area

2.1 REGULATORY SETTING FOR ALTERNATIVES ANALYSIS

Both the Council of Environmental Quality's (CEQ) National Environmental Policy Act (NEPA) Implementation Procedures [40 Code of Federal Regulations (CFR) §1502.14] and the United States Army Corps of Engineers' (USACE) NEPA Implementation Procedures (33 CFR Part 325, Appendix B) require consideration of a range of reasonable alternatives for a proposed action. Defining a range of reasonable alternatives is a key element for subsequent analyses in an Environmental Impact Statement (EIS). The CEQ (1981) describes the alternatives as being the "heart of the environmental impact statement," and alternatives that are considered *reasonable* under NEPA include those alternatives "that are practical or feasible from a technical and economic standpoint and using common sense." The USACE's NEPA Implementation Procedures define reasonable alternatives as "those that are feasible, and such feasibility must focus on the accomplishment of the underlying purpose and need (of the applicant or the public) that would be satisfied by the proposed Federal action (permit issuance)." The USACE's regulations further provide that only reasonable alternatives need to be considered in detail and that the reason for eliminating alternatives from detailed study should briefly be discussed in the EIS [33 CFR Part 325, Appendix B, sec. 9.a. (5) (a)]. NEPA regulations require that agencies consider a range of reasonable alternatives to the proposed action, including consideration of a "No Action" alternative; the regulations do not, however, require consideration of every conceivable variation of an alternative (40 CFR §1502.14). In addition, these regulations provide that, while the USACE shall not prepare a cost benefit analysis of the alternatives, the EIS should indicate any cost considerations that are likely to be relevant to a decision [33 CFR Part 325, Appendix B, sec. 9.a.(5)(d)].

The substantive criteria used by the USACE to evaluate a permit are the Section 404(b)(1) Guidelines (40 CFR Part 230) promulgated by the United States Environmental Protection Agency (USEPA). The guidelines require the evaluation of "practicable alternatives," and are used to identify the Least Environmentally Damaging Practicable Alternative (LEDPA) to ensure that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." The guidelines define an alternative as practicable "if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CFR §230.10 [a][2]). The Section 404(b)(1) Guidelines indicate that the analysis of alternatives for NEPA environmental documents will in most cases provide the information required to evaluate the alternatives under the guidelines (40 CFR §230.10 [a][4]).

The USACE and cooperating agencies evaluated and screened the alternatives mindful of both the NEPA requirements and the 404(b)(1) Guideline requirements. As a result, the alternatives analysis in this EIS also satisfies the requirement under both NEPA and the Section 404(b)(1) Guidelines. Additional analysis required to comply with the Guidelines is included in Appendix A. As described below, the USACE and cooperating agencies examined the full scope of possible alternatives and components and systematically arrived at the range of reasonable and practicable alternatives. Through this process, the USACE believes that it has captured all of the alternatives and components necessary to determine whether the Applicant's proposed project is the LEDPA.

2.2 PRELIMINARY SCREENING OF ALTERNATIVES

The USACE implemented a structured process to develop and screen alternatives for the A-1 Shallow Flow Equalization Basin (FEB) project, with a goal to consider the broadest range of possible alternatives and identify the range of reasonable and practicable alternatives that would advance for comparative analysis. The intent of an iterative process is to eliminate impracticable and unreasonable alternatives as early in the process as practical to allow the USACE and the cooperating agencies to focus detailed evaluation on practicable and reasonable alternatives. For some proposals there may exist a very large or even an infinite number of reasonable alternatives if the proposed alternatives could vary from one another due to an infinite number of incremental changes (e.g., various water depths). Nevertheless, only a range of reasonable and practicable alternatives need be considered. The USACE and cooperating agencies worked together to consider the development and screening process. Although the USACE sought the consensus of the cooperating agencies in determining reasonable and practicable alternatives that would meet the water quality goals of the project, the USACE's analysis, which is reflected in a chronological order below, is independent of USEPA's prior analysis in the 2010 Amended Determination (AD), and therefore, a Stormwater Treatment Area (STA) alternative was not identified as an alternative in the USACE's analysis until later in the process.

The initial step in the process was identification of possible alternative concepts for achieving the purpose and need of the project (see Chapter 1). Two alternatives that are always examined in an EIS are the No Action Alternative and the Applicant's Preferred Alternative. Because the USACE had originally evaluated a range of alternatives and issued a permit for the A-1 Reservoir on the project site, the USACE determined that the A-1 Reservoir was an alternative to the proposed project. The A-1 Reservoir was included in the Notice of Intent to draft an EIS published in the Federal Register prior to the Scoping meeting.

Alternative 1: No Action. As required by the CEQ, the EIS must consider as an alternative the possibility of not permitting the project. For this alternative, the activities that are considered would only be those that would not require a Department of the Army (DA) permit to discharge fill into waters of the United States (US) [33 CFR Part 325, Appendix B, Paragraph 9.b.5(b)].

Alternative 2: Shallow FEB (Applicant's Proposed Action). The Applicant is proposing to construct a shallow (approximate depth of four feet) FEB on the A-1 Project Site. The Shallow FEB is proposed to improve delivery rates to STA 2 and STA 3/4 by attenuating and temporarily storing peak stormwater flows to assist in maintaining optimal water levels and minimizing the frequency of dryouts within STA 2 and STA 3/4. This alternative is described in greater detail in Section 2.4.2 below.

Alternative 3: Deep FEB. A deep reservoir, known as the A-1 Reservoir, was previously the subject of NEPA and Section 404 permit review for this site; therefore, the USACE determined that the construction of a deep FEB similar to the previously authorized A-1 Reservoir is a reasonable alternative to the construction of a shallow FEB for consideration. A deep reservoir was also was the subject of a detailed review by the USEPA as referenced in USEPA's 2010 AD. The construction of the deep reservoir, or deep FEB, may also provide for flow attenuation, and the flow attenuation could provide water quality benefits to the STAs. Therefore, a Reservoir was considered as a reasonable alternative to the applicant's proposed project. This alternative is described in greater detail in Section 2.4.3 below.

During public scoping meeting, it was suggested that a deep Reservoir and the restoration of a pond apple slough south of Lake Okeechobee (offsite of the A-1 project site) should be considered as alternatives. During the public scoping comment period, the USEPA commented that an STA alternative was also included in the 2010 AD and should be incorporated into the USACE's alternatives analysis. The scoping comments are documented in Chapter 7. At the conclusion of the scoping period, the USACE and the cooperating agencies considered the goals of the project to generate other potential project alternatives that were not previously considered to be evaluated along with the alternatives listed above. Additional alternatives evaluated at this point included:

- A Deep Reservoir - This alternative had already been identified and carried forward as Alternative 3, which was initially identified as the A-1 Reservoir. A reservoir has similar characteristics of a Deep FEB. However, as previously described, the previously permitted A-1 Reservoir has a different project purpose than would be served by the proposed project. To avoid confusion with the name and purpose of the previous A-1 Reservoir project, this alternative, which will be carried forward for further evaluation, has been renamed as a Deep FEB (approximate depth of 12.5 feet).
- Utilizing other treatment technologies to treat and remove phosphorus from the Central Flowpath
- Utilizing other lands not currently owned by the Applicant as possible off-site Alternatives
- The restoration of a pond apple slough south of Lake Okeechobee
- Construction of a Stormwater Treatment Area on the Project Site. The construction of a STA also was the subject of a detailed review by the USEPA in the 2010 AD.

These four additional alternatives were then assessed based on their practicability, which is determined based on their ability to meet the USACE overall project purpose. The USACE coordinated with the cooperating agencies and the applicant to obtain additional details about the Applicant's proposed project as well as the other alternatives. Based on the review, the following alternatives were not considered practicable alternatives and were, therefore, eliminated from further analysis:

- *Utilizing other treatment technologies to treat and remove phosphorus from the Central Flowpath.* Various alternative treatment technologies, such as the Hybrid Wetland Treatment Technology pilot project and the Northern Everglades Chemical Treatment pilot project, are currently being conducted in the Northern Everglades watershed. The pilot projects are in various stages of testing. Similarly, other treatment technologies are unavailable to practicably meet the overall project purpose.

- *Utilizing other lands not currently owned by the Applicant as possible offsite Alternatives.* The USACE evaluated the practicability of utilizing properties not currently owned by the Applicant for offsite alternatives to be carried forward for further analysis. Given the project purpose, an alternative project site would need to work in association with and be in close proximity to STA 2 and 3/4 to meet the WQBEL at the STA discharge points. The A-1 project site is ideally located adjacent to both STA 3/4 and STA 2, allowing it to provide benefits to both STAs. Noting that the A-1 project site was contiguous to STA 2 and STA 3/4, USEPA stated in the 2010 AD that the A-1 site was "strategically located for an expansion of the current STAs" and did not provide the SFWMD any scheduled time to aquire additional lands within the Central Flowpath.

  Any project developed on another site must be acquired by the State, which requires time for land acquisition. In USEPA's 2010 AD, USEPA found acquisition times "were highly variable and has ranged from two to eight years." The USACE conducted a survey of eleven of the Applicant's restoration land acquisition experiences spanning between 1991 to 2009 and found that land acquisition has taken as little as three years and as long as 17 years to complete, with an average of 6-7 years. Acquisition time depends upon the number of willing sellers and increases due to the number of involved landowners. Other lands adjacent to STA 2 and STA 3/4 not owned by the Applicant are agricultural lands located north of STA 2, which are privately owned and utilized by three entities: Okeelanta Corporation, New Hope Sugar, and King Realty Company. None of these companies are known willing sellers. Due to the land acquisition time frames (up to 17 years) and the subsequent time for site development and construction, the USACE determined that utilizing lands not currently owned by the applicant would be an alternative that is not available to the applicant and is impracticable.

- *The restoration of a pond apple slough south of Lake Okeechobee (offsite alternative).* Although a pond apple slough restoration project could provide environmental benefits, there is no evidence that it would ensure achievement of the Water Quality Based Effluent Limits (WQBEL) at the STA discharge points. Therefore, this alternative does not satisfy the project purpose. Additionally, this alternative would be contingent upon the purchase of land currently unavailable to the applicant, which the USACE has determined is impracticable.

The alternative that was not eliminated during the practicability analysis (the construction of an STA on the project site) was advanced to the next step of the alternatives development process. The USACE's independent alternatives development and USEPA's alternatives analysis results in the same suite of alternatives: a Shallow FEB, a Deep FEB, and an STA.

> **Alternative 4: A Stormwater Treatment Area.** The construction of an STA may also ensure that the WQBEL is met at the discharge points of STA 2 and STA 3/4, and therefore an STA on the A-1 project site is considered a practicable alternative to the applicant's proposed project. The USEPA had fully evaluated the STA alternative, found that it would attain the WQBEL at the discharge points for STA 2 and STA 3/4, and recommended this option during the development of the 2010 AD.

2.3 DIFFERENCES BETWEEN A STORMWATER TREATMENT AREA AND A FLOW EQUALIZATION BASIN

2.3.1 STORMWATER TREATMENT AREA

STAs are large-scale freshwater wetlands constructed to remove phosphorus from urban and agricultural runoff prior to discharge to the Everglades. Phosphorus is removed from the water column through physical, chemical, and biological processes such as sedimentation, precipitation, plant growth, microbial activity and the accumulation of dead plant material that is converted to a layer of soil. A typical STA has multiple cells that are divided into several parallel treatment paths or flow ways. Water flows through these systems via water control structures, such as pump stations, gates, or culverts. The plant communities in STAs are broadly classified as emergent aquatic vegetation (EAV) or submerged aquatic vegetation (SAV). Interspersed among this vegetation, where conditions are favorable, are floating aquatic vegetation and periphyton communities. In contrast to conventional chemical treatment technologies which are designed to allow real time active control of treatment processes to provide technically reliable performance, STAs are, biological systems which are more complex and reliant on multiple factors that are less controllable and subject to natural perturbations.

STAs are highly managed and maintained wetlands and typically require intensive monitoring networks to enable continuous evaluation of vegetation conditions and treatment performance. Proactive management of both desirable and undesirable vegetation within STAs is critical to achieving and sustaining treatment performance. In addition, STA dryout is a major concern due to potential spikes in phosphorus concentrations that can occur upon rehydration. Therefore, strategies to manage STAs during dry conditions include proactive measures to maintain minimum water levels in an effort to reduce vegetation stress and maintain treatment performance. Additional STA acreage increases the risk of STA dryout (and potential performance reduction) and requires additional water to maintain minimum STA water levels, often at times when regional water supplies are limited and demands are high.

2.3.2 FLOW EQUALIZATION BASIN

FEBs are impoundments constructed to temporarily detain excess surface water flows prior to release into STAs. The FEBs are not intended to treat the water, but to store it during high water events until the optimal time when STA needs additional water. The FEBs would then pump water into the STAs at an ideal rate once the peak runoff flows have subsided in the canals. The FEB would achieve normal full stage level only during peak runoff conditions and is not intended to store water for any extended length of time after pumping operations cease. However, during the rainy season and extreme wet years, the FEB site could experience staged water levels for significant durations. The vegetation within the FEB is expected to be herbaceous wetland plants that are likely to aid in the removal of additional phosphorus.

2.4 DESCRIPTION OF ALTERNATIVES

As well as providing the full range of reasonable alternatives for NEPA, the four alternatives also establish the range of practicable alternatives that will be evaluated to determine the LEDPA per USACE guidance related to Section 404(b)(1) of the Clean Water Act (40 CFR Part 230). The following sections provide detailed information on the four reasonable alternatives.

2.4.1 ALTERNATIVE 1: NO ACTION

NEPA regulations require consideration of the No Action Alternative, which can be used as a benchmark for comparison of the environmental effects of the various alternatives. The No Action Alternative would result from the USACE not issuing a DA permit for fill in waters of the US regulated by the USACE under Section 404 of the Clean Water Act. Without a DA permit, no additional fill could be discharged into waters of the US.

2.4.2 ALTERNATIVE 2: SHALLOW FLOW EQUALIZATION BASIN (SOUTH FLORIDA WATER MANAGEMENT DISTRICT'S PREFERRED ALTERNATIVE)

Alternative 2 is a 15,000-acre shallow FEB with a maximum operating depth of approximately 4 feet, and is South Florida Water Management District's (SFWMD) Preferred Alternative. In the 2010 AD, the USEPA proposed that the A-1 project site be utilized as an STA to maximize phosphorus uptake. After issuance of the 2010 AD, the SFWMD updated and revised some of the hydrologic modeling upon which the USEPA had relied in developing the projects for the 2010 AD utilizing new data, information, and options that were unavailable at the time of the

2010 AD. In 2012, the SFWMD proposed that a Shallow FEB in place of the STA design would better manage and meter water flow and phosphorus load discharged into STA 2 and STA 3/4. After extensive technical discussions with the SFWMD and FDEP and thorough evaluation, the USEPA concluded that the modified plan was based on an appropriate set of assumptions and could reasonably be expected to achieve the WQBEL (USEPA 2012). Both alternatives (a Shallow FEB and an STA) are being evaluated for this EIS. Construction of the Shallow FEB would result in impacts to 435.9 acres of waters of the US to include 280.1 acres of fill to construct the levee and 112.8 acres of fill to raise the elevation of canals and ditches, as well as the discharge of fill material associated with excavation of 43.0 acres of waters of the US. Operation of the shallow FEB would inundate 10,820.3 acres of jurisdictional wetlands and 1,214.7 acres of uplands to create an emergent marsh habitat.

Alternative 2 would include the following components:

- Perimeter Levees around the FEB (> 20 miles; 8-10 feet levee heights for 4 feet maximum operating depth)
- Interior levees to convey inflows to the north end of the FEB (6.5+/- miles)
- Internal collection canal to assist in conveying water out of the FEB
- Operable water control structures to control FEB water levels and flows into and out of the FEB
- Seepage canal and pump station(s) to collect FEB seepage and return to FEB/STA 3/4
- Degradation of portions of major agriculture roads
- Demolition of the existing test cells
- Demolition of the existing Talisman and Cabassa pump stations

The site contains 1,200 foot wide areas that have been scraped down to the cap rock along the perimeter of the site that would be incorporated as a flow path into the interior footprint of the Shallow FEB. By utilizing the available scraped down area as a flow path, it has been determined by the SFWMD, based on preliminary hydraulic analyses, that the existing pump stations G-370 and G-372 currently have the capability to deliver flows to the north end of the FEB.

Inflows will be conveyed to the Shallow FEB via two proposed operable water control structures by the existing STA 3/4 inflow pump stations G-370 and G-372. The Shallow FEB will receive runoff from the Miami Canal via existing pump station G-372, and from the North New River Canal via existing pump station G-370. After inflows are conveyed to the north end of the Shallow FEB, the water will be spread utilizing the northern scraped area to enable sheet flow from north to south. An internal collection canal will be constructed to assist in conveying water out of the Shallow FEB. Outflows will be conveyed by operable water control structures to the North New River Canal. Operable water control structures may also be constructed to allow discharges to be conveyed via gravity directly to the STA 3/4 inflow canal. The perimeter seepage canals constructed during the EAA A-1 Reservoir project have been evaluated by the SFWMD and determined to be adequate to protect adjacent properties, including US Highway 27. The majority of the Shallow FEB outflows (approximately 80%) will be directed to STA 3/4 for treatment while the remaining flows (approximately 20%) will be conveyed to STA 2 (including Compartment B) via the G-434 and G-435 pump stations.

2.4.3 ALTERNATIVE 3: DEEP FLOW EQUALIZATION BASIN

Alternative 3 is a 15,000-acre deep Flow Equalization Basin, with a maximum operating depth of approximately 12.5 feet. A deep FEB can attenuate flows to the STAs to improve STA performance. This differs from typical storage reservoirs, including the earlier design that was the subject of the 2006 EIS that often have multiple objectives such as water supply for the environment, urban, or agricultural uses. Similar to the Shallow FEB, construction of the Deep FEB would result in impacts to 576.6 acres of waters of the US to include 533.6 acres of fill to construct the levee and the discharge of fill material associated with excavation of 43.0 acres of waters of the US. Operation of the deep FEB would inundate 10,820.3 acres of jurisdictional wetlands. As the inundation would be greater than four feet during parts of the year, emergent marsh habitat at the site would have a less optimal hydrology during those times when the water levels are greater than four feet. The remainder of time when water levels are below four feet, it is anticipated that either submerged aquatic or emergent marsh vegetation would be present.

Alternative 3 was assumed to include the following components, at a minimum:

- Perimeter Levees around the FEB (> 20 miles; 20-30 feet levee heights for a maximum operating depth of 12.5 feet)
- Inflow Pump Station to direct North New River Canal flows into the FEB to the maximum operating depth of 12.5 feet
- Internal collection canal to assist in conveying water out of the FEB
- Operable water control structures to control FEB water levels and flows into and out of the FEB
- A cutoff wall to minimize or eliminate seepage impacts to adjacent areas
- Seepage canal and pump station(s) to collect FEB seepage and return to FEB/STA 3/4
- Degradation of portions of major agriculture roads
- Demolition of the existing test cells
- Demolition of the existing Talisman and Cabassa pump stations

Based on hydraulic analyses, the existing pump stations G-370 and G-372 currently do not have the capability to deliver flows to the Deep FEB up to the maximum operating depth of 12.5 feet. Therefore, a new inflow pump station located at the northeast corner of the Deep FEB would be required to deliver flows to the Deep FEB up to the maximum operating depth of 12.5 feet. Inflows will be conveyed to the Deep FEB via two proposed operable water control structures by the existing STA 3/4 inflow pump stations G-370 and G-372 and a new inflow pump station. The Deep FEB will receive stormwater runoff from the Miami Canal via existing pump station G-372, and from the North New River Canal via existing pump station G-370 and the new inflow pump station.

An internal collection canal may be constructed to assist in conveying water out of the Deep FEB. Outflows will be conveyed by operable water control structures to the North New River Canal. Operable water control structures may also be constructed to allow FEB discharges to be conveyed via gravity directly to the STA 3/4 inflow canal. A new cutoff wall and the perimeter seepage canals constructed during the EAA A-1 Reservoir project will likely be improved to protect adjacent properties, including US Highway 27. The majority of the Deep FEB outflows (approximately 60%) will be directed to STA 3/4 for treatment while the remaining flows (approximately 40%) will be conveyed to STA 2 (including Compartment B) via the G-434 and G-435 pump stations.

2.4.4 ALTERNATIVE 4: STORMWATER TREATMENT AREA

Alternative 4 is a 15,000-acre STA, with a maximum operating depth of approximately 4 feet. As previously mentioned, the USEPA's AD proposed that a the A1 Site be utilized as an STA to maximize phosphorus uptake in association with STA 2 and STA3/4. After issuance of the 2010 AD, the SFWMD updated and revised some of the hydrologic modeling and proposed the Shallow FEB in place of the STA design. After extensive technical discussions with the SFWMD and FDEP and thorough evaluation, the USEPA concluded that the plan was based on an appropriate set of assumptions and could reasonably be expected to achieve the WQBEL. Both alternatives are being evaluated for this EIS. The proposed STA would have a normal operating depth of approximately 1.25 – 1.5 feet and a maximum operating depth of approximately 4 feet. The proposed A-1 STA would operate in parallel with STA 2 and STA 3/4. Construction of the A-1 STA would result in impacts to 986.4 acres of waters of the US to include 353.6 acres of fill to construct the levee, 112.8 acres of fill to raise the elevation of canals and ditches, 270 acres of canal excavation, and 250 acres of excavation and fill within Holey Land Wildlife Management Area (Holey Land). Wetland impacts within the Holey Land are required to construct a new discharge canal to allow treated discharges from the A-1 STA to be conveyed to the L-5 Canal. The new discharge canal would be proposed west of STA 3/4 Cells 3A and 3B while the existing STA 3/4 discharge canal south of STA 3/4 Cell 3B would be expanded. Within the proposed A-1 STA, over 10,500 acres of waters of the US would be inundated to create an emergent marsh habitat similar to other STAs.

Alternative 4 was assumed to include the following components, at a minimum:

- Perimeter Levees around the STA (> 20 miles; 8-10 feet levee height for 4 feet maximum operating depth)
- Interior levees dividing the STA into cells
- Inflow canals to direct inflows from the North New River and Miami Canals to the STA
- Discharge canal to direct outflows from the STA to the L-5 Canal
- Internal distribution canals to facilitate sheetflow through the cells
- Internal collection canals to assist in conveying water out of the cells
- Seepage canal and pump station(s) to collect STA seepage and return to STA
- Operable water control structures to control water levels and flows into and out of all STA cells

For this EIS, the A-1 STA represented in Alternative 4 was assumed to utilize the existing STA 3/4 inflow pump stations (G-370 and G-372) to convey stormwater runoff to the proposed A-1 STA. Inflows are then assumed to be conveyed via inflow canals to the north end of the project site. Flows would then be distributed to the A-1 STA cells via water control structures and conveyed north-to-south and collected in internal collection canals. In order to operate the A-1 STA, construction of conveyance features in addition to construction of the A-1 STA itself will be required. Specifically, a discharge canal would need to be constructed within the Holey Land to connect the A-1 STA discharge canal to the L-5 Canal. This would enable the delivery of discharges from the proposed A-1 STA to Water Conservation Area (WCA) 2A and/or WCA 3A via existing infrastructure, without interfering with the existing operations of STA 2, STA 3/4 and the North New River and Miami Canals.

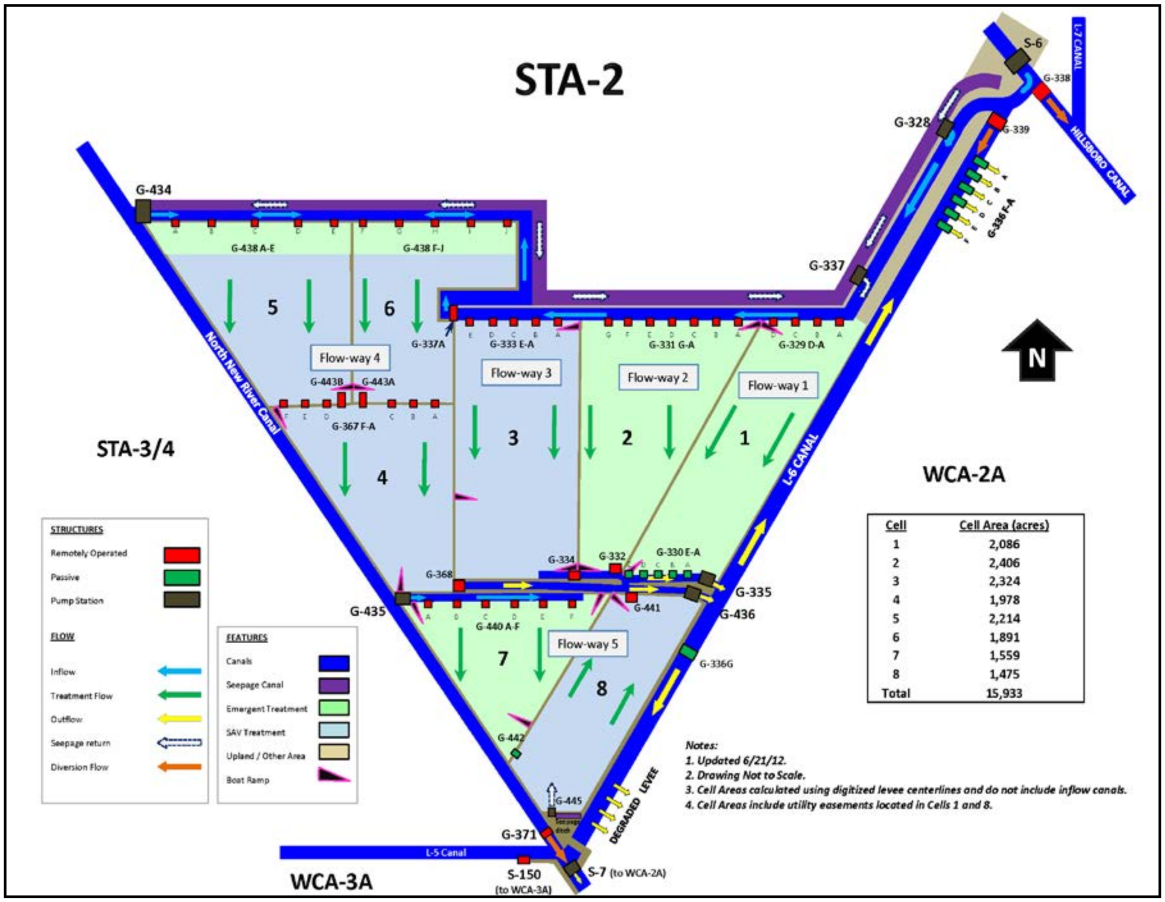
2.5 COMPONENTS COMMON TO ALL ACTION ALTERNATIVES

The following components of the Central Flowpath, including STA 2 (including Compartment B) and STA 3/4, WCA 2A and WCA 3A are common to all of the alternatives although the timing and volumes of inflow and outflow to the components would vary by alternative.

2.5.1 STORMWATER TREATMENT AREA 2

STA 2 is a 16,000-acre constructed wetland marsh system which was designed to reduce phosphorus concentrations in surface water. The facility is located within southern Palm Beach County and is immediately adjacent to the western boundary of WCA 2A. STA 2 consists of Flow-way 1 (Cell 1), Flow-way 2 (Cell 2), Flow-way 3 (Cell 3), Flow-way 4 (Cells 4, 5 and 6), and Flow-way 5 (Cells 7 and 8) (**Figure 2-1)**. STA 2 currently receives runoff from the S-2, S-5A, S-6 and S-7 Basins, East Shore Water Control District and 715 Farms (also known as Closter Farms). Runoff collected by the North New River Canal is pumped into STA 2 via the G-434 and G-435 pump stations. Runoff collected via the Hillsboro Canal is pumped into STA 2 via the S-6 pump station. In addition, stormwater runoff from agricultural lands adjacent to STA 2 is pumped into STA 2 via the G-328 pump station. Treated discharges from STA 2 are pumped into the L-6 Canal, and then conveyed to either northern WCA 2A through a set of box culverts or to western WCA 2A through a section of degraded L-6 Canal levee.

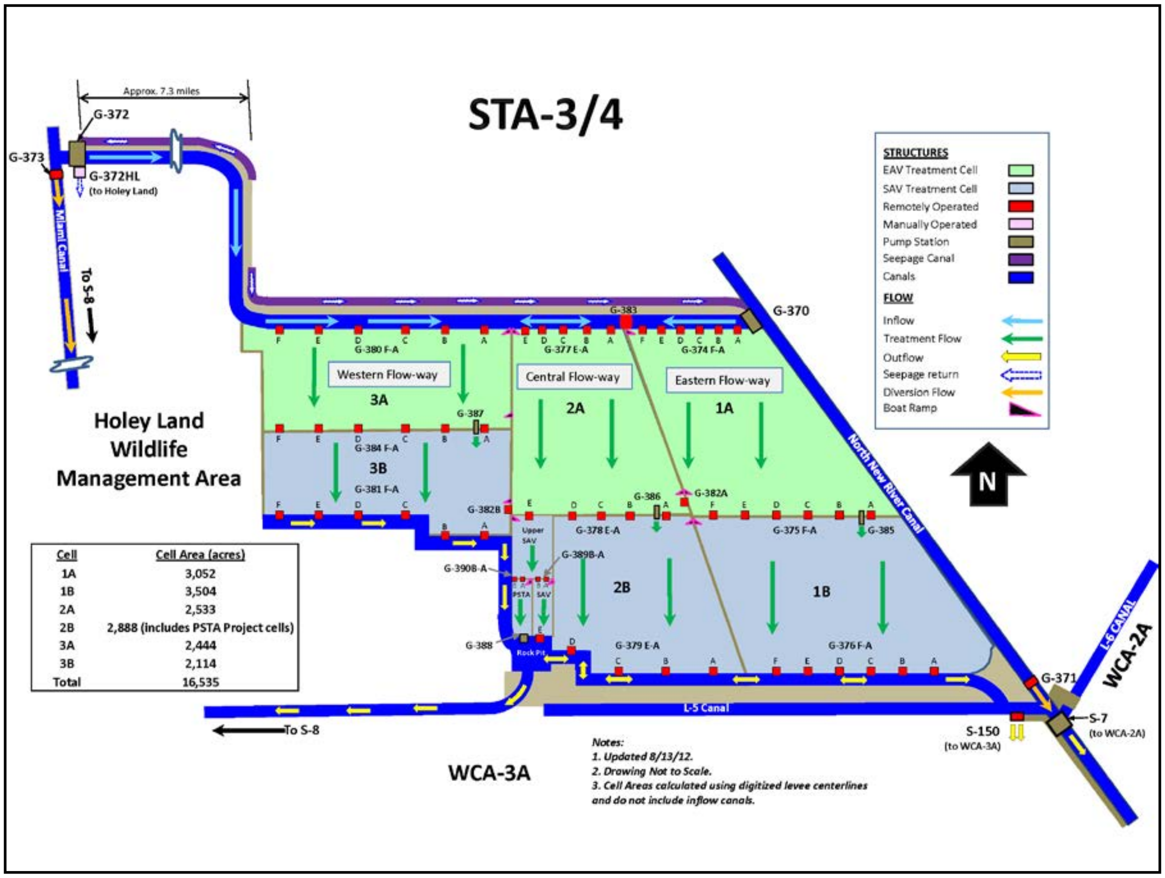
Figure 2-1 Schematic of STA 2



2.5.2 STORMWATER TREATMENT AREA 3/4

STA 3/4 is a 16,000-acre constructed wetland marsh system which was designed to reduce phosphorus concentrations in surface water. The facility is located in southern Palm Beach County between STA 2 and the Holey Land. STA 3/4 consists of the Eastern Flow-way (Cells 1A and 1B), the Central Flow-way (Cells 2A and 2B), the Western Flow-way (Cells 3A and 3B), and the Periphyton-based STA Implementation Project. STA 3/4 currently receives agricultural and/or urban runoff from the S-2, S-3, S-7, S-8, and C-139 Basins, the South Shore Drainage District and the South Florida Conservancy District. Runoff collected by the North New River Canal is pumped into STA 3/4 via the G-370 pump station. Water collected via the Miami Canal is pumped into STA 3/4 via the G-372 pump station. Treated discharges from STA 3/4 are conveyed to the STA 3/4 Discharge Canal and L-5 Canal, and then conveyed to either western WCA 2A via the S-7 pump station, to eastern WCA 3A via S-150, or western WCA 3A via the S-8 pump station. A schematic drawing of STA 3/4 is provided in **Figure 2-2**.

Figure 2-2 Schematic of STA 3/4



2.5.3 WATER CONSERVATION AREAS 2A AND 3A

WCA 2A operates under the current Central and Southern Florida (C&SF) Project regulation schedule. Operations of WCA 2A also include regulatory releases to the Atlantic Ocean through the Lower East Coast canals, as documented in the C&SF Project Water Control Plan for Lake Okeechobee and Everglades Agricultural Area (Water Control Plan), (USACE, June 2008). In addition, no net outflows from WCA 2A to maintain minimum stages in the Lower East Coast Service Area canals (salinity control) are assumed, if water levels in WCA 2A are less than the minimum operating criteria of 10.5 feet National Geodetic Vertical Datum of 1929 (NGVD29). Any water supply releases below the minimum operating criteria are matched by an equivalent volume of inflow, typically from Lake Okeechobee.

WCA 3A operates under the current Everglades Restoration Transition Plan (ERTP) regulation schedule. As discussed in Chapter 1, ERTP is the water management operating criteria for Central and Southern Florida Project features and the constructed features of the Modified Water Deliveries and Canal-111, which were recently adopted. Since this new operating regime went into effect in October 2012, the ERTP regulation schedule for WCA 3A, as per South Florida Water Management Model alternative 9E1, was assumed for this EIS. Operations of WCA 3A also include regulatory releases to the Atlantic Ocean through the Lower East Coast Canals, as documented in the Water Control Plan (USACE, June 2008). In addition, no net outflows from WCA 3A to maintain minimum stages in the Lower East Coast Service Area canals (salinity control) are assumed, if water levels in WCA 3A are less than the minimum operating criteria of 7.5 feet NGVD29. Any water supply releases below the minimum operating criteria are matched by an equivalent volume of inflow, typically from Lake Okeechobee.

CHAPTER 3

AFFECTED ENVIRONMENT

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3.0 AFFECTED ENVIRONMENT

This chapter provides a description of the physical, biological, chemical, and human environments that could be affected by alternatives evaluated. The existing conditions are presented in either a regional- or area-specific context depending on the nature of the resource or the anticipated effect to that resource.

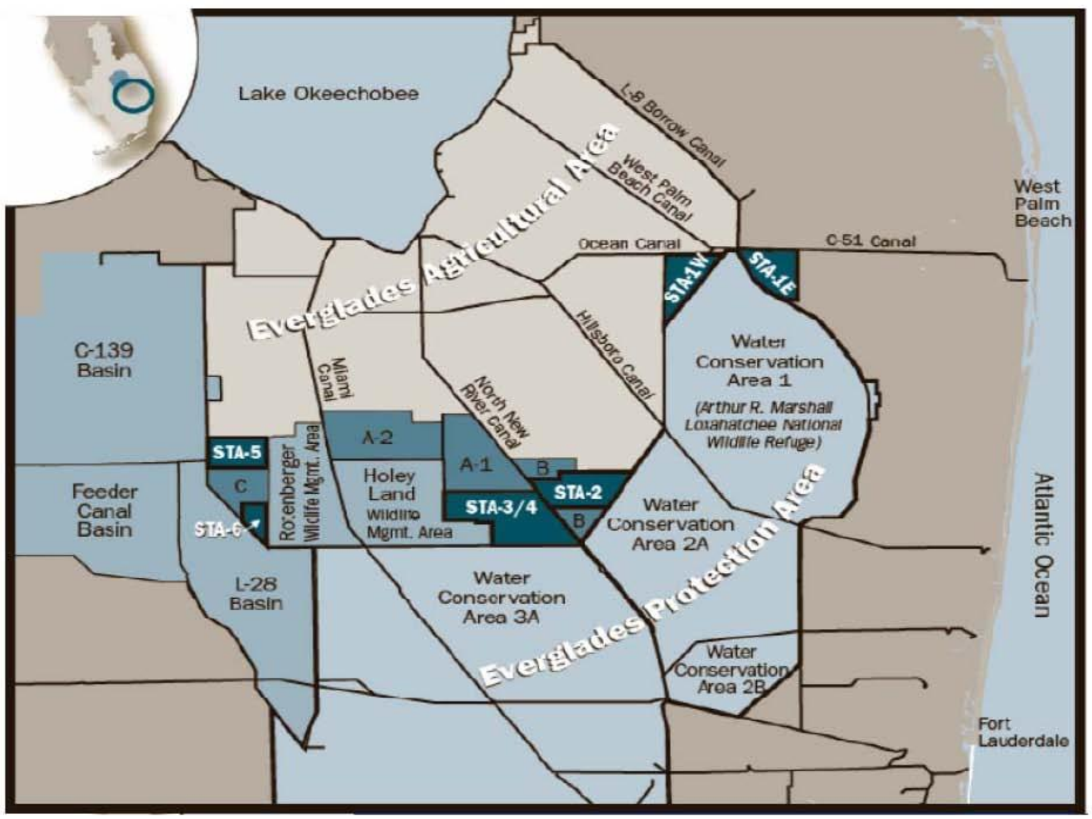
3.1 GENERAL ENVIRONMENTAL SETTING

Lake Okeechobee, located north of the project area, is an approximately 730-square-mile freshwater lake located north of the Everglades Agricultural Area (EAA) with an average depth of roughly 9 feet (USACE 2007a). The depressional area, now occupied by Lake Okeechobee, was formed approximately 6,000 years ago when the Okeechobean Sea receded (Lodge 2004). The depressional area then filled with water during the following period of wetter conditions. Historically, water flowed south from the lake to the Everglades through a series of small tributaries at the southern portion of the lake. Once the headwaters of the Everglades, the waters are now contained by the Herbert Hoover Dike and by an earthen levee around the southern perimeter of the lake. Discharges, water levels, and flows are highly managed through a series of water control structures and canals including the structures that discharge water to the EAA.

The EAA is located south of Lake Okeechobee primarily in western Palm Beach County (**Figure 3-1**), extending south to Water Conservation Area (WCA) 3A. It is bounded on the east by the Arthur R. Marshall Loxahatchee National Wildlife Refuge, which is WCA-1 (herein referred to as the Refuge), WCA 2A, the Western C-51 Basin, the L-8 Basin, and on the west by the C-139 Basin. Historically, the EAA was pond apple swamp forest on the southern shore of Lake Okeechobee and an extensive sawgrass wetland, which have been drained and put into agriculture production. The former wetlands produced the rich organic peat and muck soils that today make it a highly productive agricultural area. As of September 30, 2011, there were 474,622 acres of land under active agricultural production in thirty-two (32) South Florida Water Management District (SFWMD) permits in the EAA (Office of Agricultural Water Policy 2011). The agricultural area designation was formally established in the 1950s and associated water management infrastructure was substantially completed in 1962 (USACE and SFWMD 2004). As of 2004, sugar cane was reported to be the area’s dominant crop with approximately 898 square miles (575,000 acres) of active sugar cane fields; this harvest provides 50 percent of the sugar produced nationally (USACE and SFWMD 2004).

Runoff from the EAA, which contains relatively high levels of nutrients (mainly phosphorus and nitrogen from particulate matter and fertilizers), drains from the agricultural canals to the secondary canals, then into the six main primary canals, and are eventually discharged into the Everglades Protection Area (EPA) or to tide. In addition to flood protection, the canals and water control structures convey regulatory and/or water supply releases from Lake Okeechobee to the EAA, the WCAs, and the Everglades National Park (ENP). The canals also provide for municipal water supply to eastern Palm Beach, Broward, and Miami-Dade Counties (Cooper 1989).

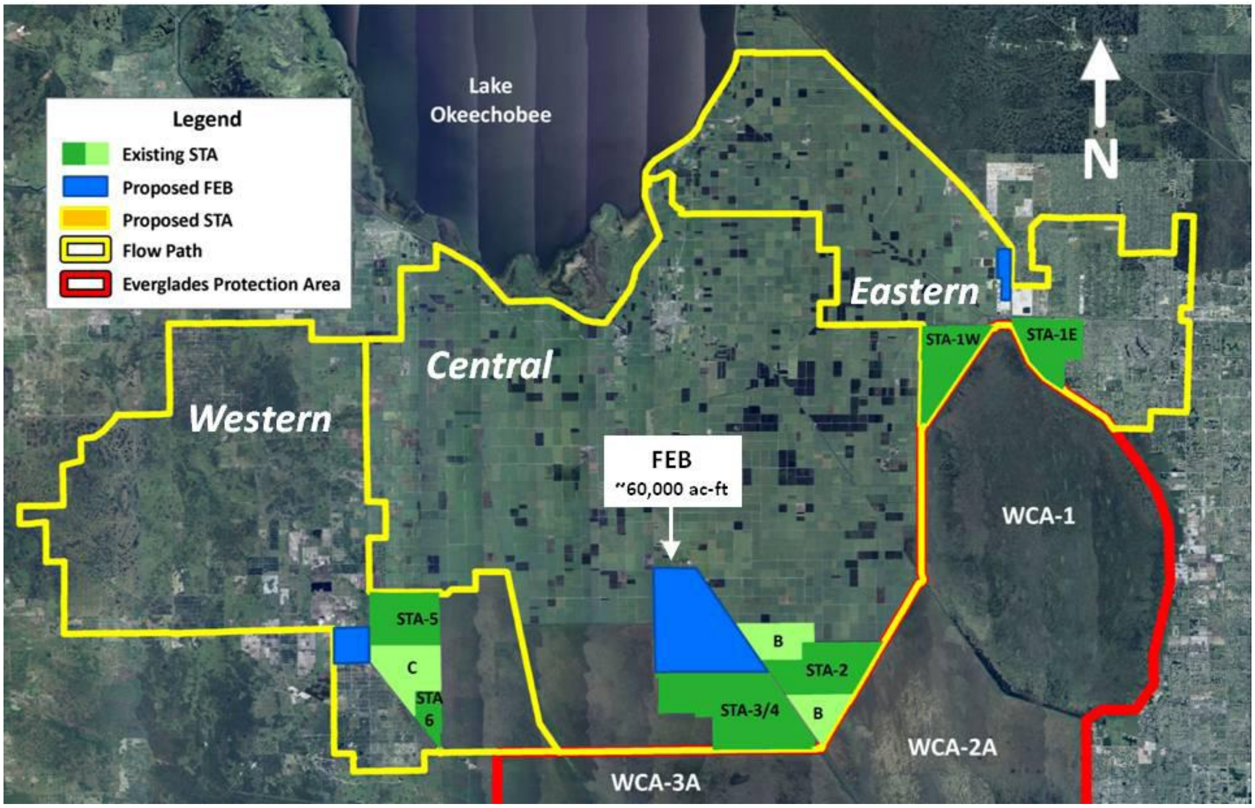
Figure 3-1 Major Areas of the South Florida Environment. Image: Pietro et al., 2008.



As described in Chapter 1, the Central Flow Path consists of the bulk of the EAA. In relation to the above described features, Compartment A-1 (A-1 project site) is at the south central portion of the Central Flowpath and immediately north of Stormwater Treatment Area (STA) 3/4 (**Figure 3-2**). The project site is approximately 16,000 acres and bordered to the east by United

States (US) Highway 27, to the south by STA 3/4, to the west by an area known as the Holey Land Wildlife Management Area (Holey Land) and to the north by agricultural lands.

Figure 3-2 Map of Western, Central and Eastern Flow-paths



3.2 SCOPE OF THE AFFECTED ENVIRONMENT

The following regions comprise the extent of the affected regions for all alternatives:

- the Central Flow Path
- project site
- STA 2
- STA 3/4
- WCA 2A
- WCA 3A; and
- Holey Land Wildlife Management Area

The physical, biological, chemical, and human environments of those areas that may be affected include land use; geology, topography, and soils; hydrology to include surface water and ground water hydrology; water quality; climate; vegetation and cover types; threatened and endangered species; fish and wildlife species; aesthetics; cultural, historic and archaeological resources; socioeconomics; environmental justice; recreation; hazardous and toxic wastes; and flood protection. The spatial extent of the effect for each components described in this chapter varies based on the geographic extent of effects on the environment being described and will be addressed by topic.

Areas not considered as part of the affected environment include Lake Okeechobee, C-139 Basin, and the Rotenberger Wildlife Management Area since the No Action Alternatives and the Action Alternatives would have no effect on these areas.

3.3 LAND USE

The general pattern of land use within the region of South Florida consists of an expanding zone of urban development within the coastal strip adjacent to the Atlantic Ocean; a large area dominated by intensive agricultural use east, south, and west of Lake Okeechobee; and a band of largely undeveloped land within the EPA. The following discussion addresses existing land use patterns within the project site, the STAs and other areas including the WCAs and the Holey Land.

3.3.1 PROJECT SITE

On March 26, 1999, the Nature Conservancy (TNC) closed on the acquisition of approximately 50,000 acres of land located within the southern portion of the EAA in Palm Beach and Hendry Counties. This acquisition was the culmination of many years of negotiations. The complex transaction was structured in two phases involving agreements between Talisman Sugar Company and other sugar companies, the Departmetn of the Interior (DOI), TNC, and the SFWMD. The DOI provided $99,434,312 in federal Farm Bill funds for the acquisition of these lands and the SFWMD provided $12,939,906. Compartments A, B, and C lands were purchased in part with this acquisition as described in the Framework Agreement

The land acquisition included the 16,000-acre A-1 project site. The SFWMD has managed the A-1 property under agricultural leases prior to the land being utilized for a restoration project. A project to construct a reservoir on the A-1 project site was included in the Comprehensive Environmental Restoration Plan (CERP) as it was designed to improve the quantity, quality, timing and delivery of water in the Everglades. The reservoir would have provided water storage in order to improve timing of water deliveries from the EAA to the WCAs, reduce Lake Okeechobee regulatory releases to the estuaries, meet supplemental agricultural irrigation demands, and increase flood protection within the EAA. In 2006, SFWMD was given Department of the Army (DA) authorization to construct the reservoir on the A-1 project site. USFWS/DOI provided approval for the interim land use change for construction of the reservoir.

3.3.2 STORMWATER TREATMENT AREAS

STA 2 (including Compartment B) and STA 3/4 were constructed and are being operated to provide water quality improvement in discharges to the EPA. Physical features within the existing STAs include the constructed wetlands and the associated water management infrastructure (such as levees, canals, and water control structures). Land cover within the STAs is primarily a mixture of open water, emergent, and submergent marshes. Land use for these areas can be classified as public/institutional or conservation. To varying degrees, the STAs also support ancillary recreational uses such as hunting, fishing, and wildlife viewing.

3.3.3 WATER CONSERVATION AREAS AND HOLEY LAND WILDLIFE MANAGEMENT AREA

WCAs 2 and 3 abut the southern boundaries of the EAA (**Figure 3-1**). WCAs 2A and 3A were designated primarily to receive flood waters from adjacent areas and store the waters for beneficial municipal, urban, and agricultural uses; however, they are currently managed for multiple uses including flood protection, water supply storage, and environmental resource protection. The Holey Land is managed for environmental resource protection. The Florida Fish and Wildlife Conservation Commission (FWCC) currently manages the fish and wildlife resources in the WCAs and the Holey Land.

3.4 GEOLOGY, TOPOGRAPHY, AND SOILS

3.4.1 GEOLOGY

At the project site, the upper carbonate sand and limestone constitutes the Fort Thompson Formation. Below this, shelly sand and sparse limestone constitutes the Caloosahatchee Formation and possibly part of the Tamiami Formation. The top of the Fort Thompson Formation consists of a hard limestone layer about four and a half to five feet thick, which is locally called caprock. The caprock is generally white, light gray, tan or yellowish brown. The caprock is underlain by silty carbonate sand extending to about 23.5 to 24.5 feet deep, where another hard limestone layer one and a half feet to three feet thick is encountered. A thinner, hard limestone layer about one half foot to one foot thick is often encountered at around 16 to

17 feet deep. The sand and lower limestone layers are generally white to very pale brown. Laboratory testing of the sand sampled in the borings averaged 84.2 percent calcium carbonate content with an average of 22 percent passing the #200 sieve in gradation tests. Visual inspection of the sand samples from the borings revealed that they include shell fragments, and tend to be angular and platy (USACE 2006).

All the Fort Thompson Formation limestone layers exposed in core or in excavations at the project site are very fossiliferous. The sand exposed in the seepage collection canals and dewatering sumps was abundantly fossiliferous with gastropods, pelecypods, corals, and echinoderms.

Portions of the project site and surrounding areas also contain the Caloosahatchee Formation. The top of the Caloosahatchee Formation is composed of fine grained, subrounded, shelly quartz sand that is mixed with shelly carbonate sand similar to that in the Fort Thompson Formation. The Caloosahatchee Formation at the site is 30 to 60 feet thick; however, the interface between this formation and the underlying Tamiami Formation is difficult to define. The proportions of carbonate to quartz sand vary. Laboratory testing on the sampled sand indicated an average calcium carbonate content of 40.1 percent and an average of 12.1 percent of material passing through the #200 sieve. The primary color of the geologic material in the Caloosahatchee Formation is light greenish gray (USACE 2006).

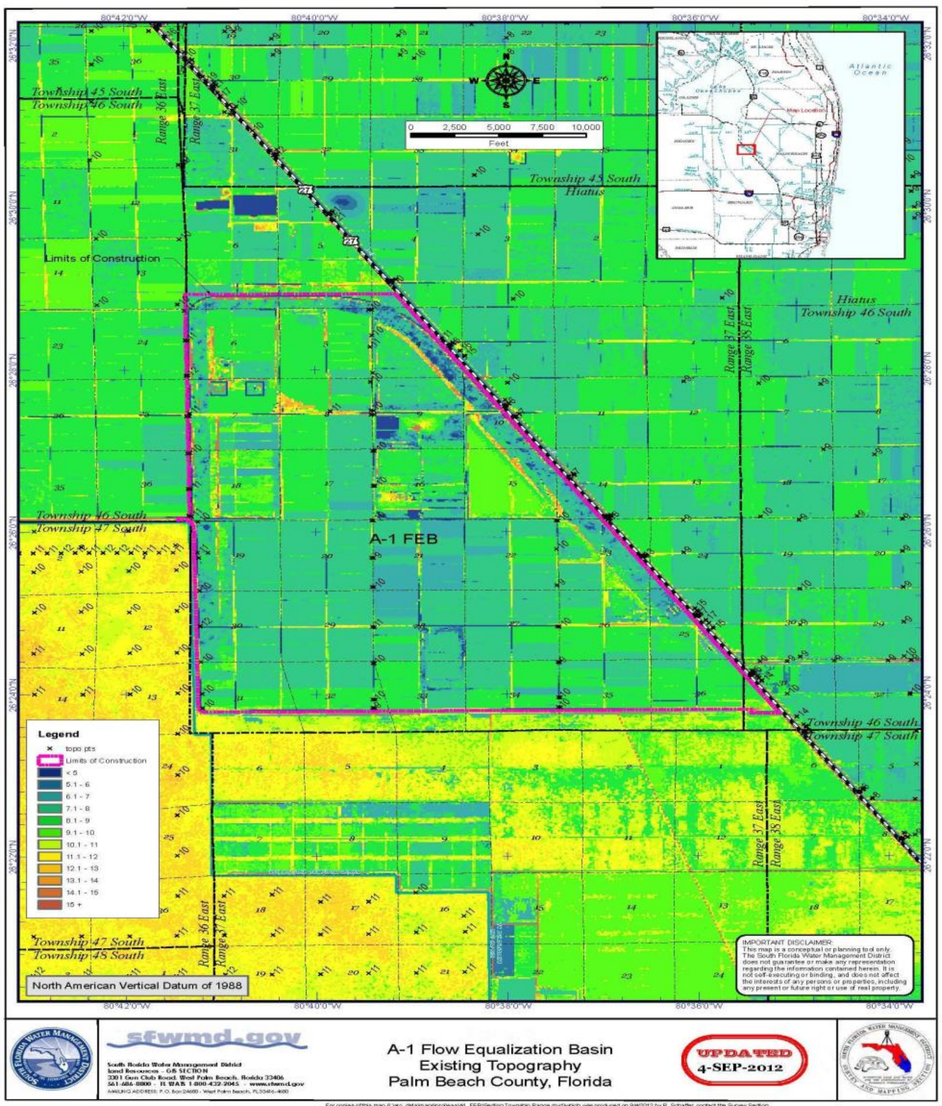
Other geologic information may indicate that the Caloosahatchee Formation is not present at the project site. For instance, geological work (Reese and Cunningham, 2000) has redefined the stratigraphy of the area. Presently, the Tamiami Formation has several recognized named and unnamed geologic members including the Ochopee Limestone Member and the Pinecrest Sand Member. Both Tamiami Formation members contain sandy strata, but the Pinecrest Sand Member is principally shelly, fine grained, quartz sand. Therefore, interpretation of the contact between the Caloosahatchee Formation and Tamiami Formation at the project site is not possible (USACE 2006).

3.4.2 TOPOGRAPHY

The Central Flowpath consists of agricultural lands in the EAA, the project site, STAs 2 and 3/4, and the Holey Land, while WCA 2A and WCA 3A are located south of the Central Flowpath. The topography within the Central Flowpath and the WCAs 2A and 3A is relatively flat. The EAA contains elevations generally less than 18.6 feet North American Vertical Datum (NAVD) 1988, and the ground surface generally slopes from north to south with an average gradient of 0.15 foot per mile.

With the exception of work performed at the site under the permit for the previous A-1 Reservoir Project, the majority of elevations of the unfilled and unexcavated areas at the site range from 7 to 9 feet NAVD 1988 (SFWMD recordings, 2012). A seepage canal was constructed just within the east, west, and north property borders of the project site, with elevated areas inside the canal where the associated fill was placed. In addition, a remnant mining area in the northeast portion of the project site has elevations less than 5 feet NAVD 1988, and an adjacent stockpile area with elevations up to 15 feet NAVD 1988. The elevations of areas surrounding the project site generally range from 6 to 11 feet NAVD 1988 (SFWMD recordings, 2012). See **Figure 3-3** for site elevations.

Figure 3-3 A-1 Project Site Existing Topography



3.4.3 SOILS

According to the United States Department of Agriculture Soil Survey of 1988, 96 percent of the EAA is composed of the following series of soils: Torry muck (7%), Terra Ceia muck (9%), Pahokee muck (27%), Lauderhill muck (40%), Dania muck (10%), and Okeechobee muck (3%). The remaining 4 percent of the EAA is composed of sands (Okeelanta muck) (Bottcher and Izuno 1994). Historically, the EAA was part of the largest region of organic soils, commonly 14 feet thick or more. Through the years of draining and agricultural production, these soils have been significantly reduced or in some areas even lost completely (Lodge 2004). Recent studies have been conducted on the subsidence of soils in the EAA, and it is projected that by 2050 nearly half of the EAA will have less than 8 inches of soil, which means the soil elevation on average is decreasing 0.6 inches a year (Snyder 2004).

The A-1 project site contains Pahokee muck (primarily in the southern portion of the site) and Lauderhill muck (primarily in the northern portion of the site). Numerous soil borings, taken from 50 to 100 feet below ground surface, were completed within the project site in December 2004 and January 2005. The borings generally penetrated through approximately one half to two feet of surficial peat/muck and marl, then through 22 to 26 feet of primarily carbonate sand and limestone, and then into primarily shelly quartz sand with sparse limestone to their completed depths. The marl beneath the peat and muck is known by some authors as the Lake Flirt Marl (Reese and Cunningham, 2000; Harvey et. al., 2002), but is undifferentiated from the peat and muck layer for this EIS.

South of the EAA, the WCAs and Holey Land primarily consists of muck and peat type soils, with the underlying substrate classified as marl and/or limestone. Other soils in these areas that have poor natural drainage (predominantly alfisols and entisols with histosols) include fine sand and loamy material.

Figures 3-4 and 3-5 Photos of Peat and Marl Soils of the Everglades, respectively (from Scheidt and Kalla, 2007)

3.5 HYDROLOGY

Water in the EAA is managed to provide flood protection, irrigation, and fresh water for the EAA and surrounding environmentally sensitive areas through a series of canals, levees, culverts, gates, and pumps (USACE and SFWMD 2004). Within the Central Flowpath, three major canals pass through the EAA and receive flows from Lake Okeechobee and runoff from the EAA: Hillsboro Canal, North New River Canal, and Miami Canal. Discharge from Lake Okeechobee and runoff from the EAA, which contain relatively high levels of nutrients (mainly phosphorus and nitrogen from particulate matter and fertilizers), drain from the agricultural canals, to the secondary canals, into the primary canals. These three canals discharge to the STAs through pump structures as detailed below.

STAs outflow into WCAs, which serve as surface water impoundments developed to provide water supply, water storage, flood control, and wildlife conservation (SFWMD 2007) and are subjects of Everglades restoration activities. At times, when conditions do not allow for the STAs to treat all runoff water prior to discharge, diversion to the WCAs may occur without treatment. WCAs are Everglades wetlands surrounded by levees and typically include a rim canal located on the inside of the levees next to the largely undisturbed peat soils and wetland plant communities. The marsh vegetation, along with the east coast protection levee, prevents floodwaters that historically flowed eastward from the Everglades from flowing into the developed areas along the southeast coast of Florida (USACE 2011).

3.5.1 OVERALL WATER MANAGEMENT

Currently, water levels in Lake Okeechobee are managed by a regulation schedule by transferring water through a complex system of pumps and locks. The Lake Okeechobee regulation schedule attempts to achieve the multiple-use purposes as well as provide seasonal lake level fluctuations. Flood control improvements around Lake Okeechobee consist of a system of approximately 1,000 miles (1,600 km) of encircling levees, designed to withstand a severe combination of flood stage and hurricane occurrence.

The management of water from Lake Okeechobee to the EPA is through the network of canals constructed as a result of the Central and Southern Florida (C&SF) Project. The C&SF Project's intention was to provide water storage in the WCAs and to better control water levels in the Everglades for multiple purposes. The construction of canals, levees, and roads has eliminated the historical freshwater sheet flow and resulted in changes in the timing and quantity of flow within the system that have influenced water quality conditions and impacted the downstream EPA. On average, about 900,000 ac-ft of water is discharged from and through the EAA to the south and southeast, historically mostly discharging into the EPA (Abtew and Khanal, 1994; Abtew and Obeysekera, 1996). Four primary canals (Hillsboro Canal, North New River Canal, Miami Canal, and West Palm Beach Canal) and three connecting canals (Bolles Canal, Cross Canal, and Ocean Canal) facilitate runoff removal and irrigation water supply. Currently runoff/drainage from the EAA is discharged to the STAs for treatment and released to the WCAs.

The WCAs are regulated for the Congressionally-authorized C&SF project purposes to provide flood control; water supply for agricultural irrigation, municipalities and industry, and ENP; regional groundwater control and prevention of saltwater intrusion; enhancement of fish and wildlife; and recreation (USACE 2011). The current operating regime for WCA 3A is Everglades Restoration Transition Plan (ERTP). ERTP superseded the 2006 Interim Operational Plan (IOP) because the IOP was no longer a viable option for water management within WCA 3A based on the status of endangered species within WCA 3A. The ERTP maximizes operational flexibilities to provide further hydrological improvements consistent with protection of multiple listed animal species, including the Everglades snail kite, wood stork and other wading birds and their habitats in south Florida, while maintaining nesting season requirements for the Cape Sable Seaside Sparrow, along with C&SF Project purposes. Water management operating criteria outlined within ERTP is to be superseded once the features of the Modified Water Deliveries (MWD) to the Everglades National Park project and the C-111 Project are available for water management operations. Therefore, the ERTP serves as a transition plan between the previous 2006 IOP for Protection of the Cape Sable Seaside Sparrow and a future operational plan.

Currently, the MWD Project elements are scheduled to be constructed by the end of 2013. (USACE March 2011).

3.5.2 SURFACE WATER

3.5.2.1 Project Site

The surface water hydrology at the A-1 project site is currently rainfall driven. The site was previously farmed as agricultural lands, but the agricultural activities have ceased. As a result of the prior construction activities for the A-1 Reservoir, a seepage canal was constructed within the north, east and west border of the project site. The canal was not completed. To maintain flow, the levee at the south end of the A-1 project site was degraded to allow surface runoff to enter the STA 3/4 seepage canal. Therefore, the surface waters currently flow from the existing agricultural ditches to the STA 3/4 seepage canal.

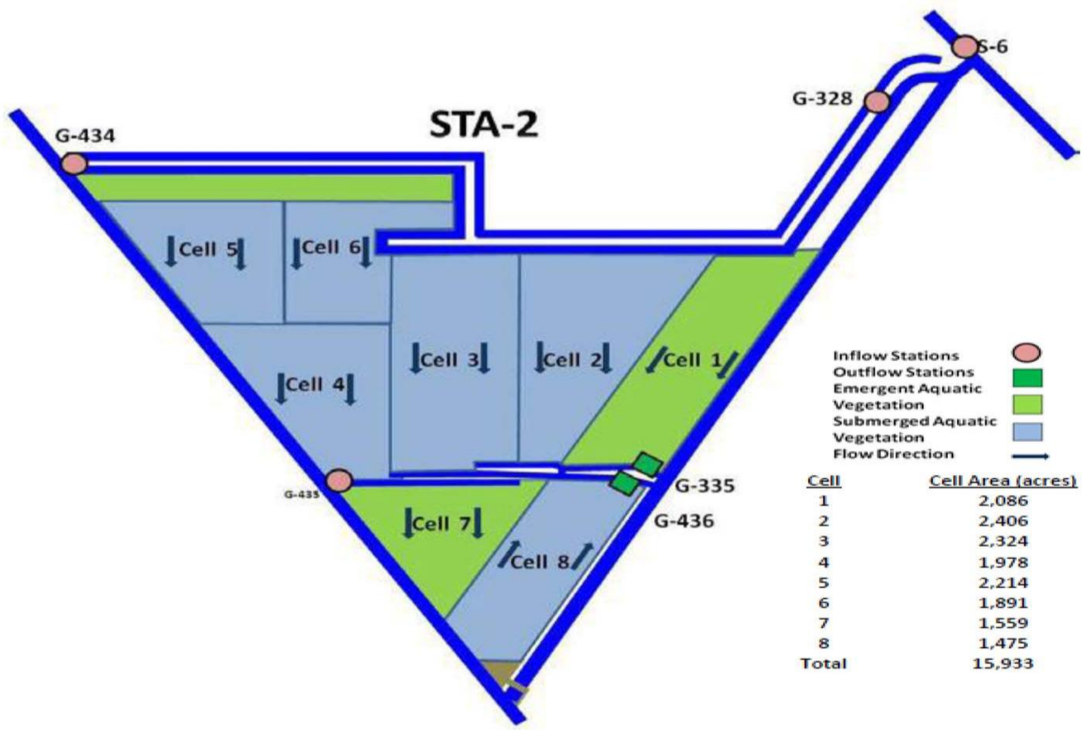
3.5.2.2 Stormwater Treatment Area 2

The general management goal for STAs is to maintain shallow inundation in emergent aquatic vegetation cells (EAV) for most of the year and to maintain shallow inundation of submerged aquatic vegetation (SAV) cells throughout the year. Dry out and desiccation of submerged aquatic vegetation and associated periphyton communities causes mortality and a significant reduction in phosphorus removal performance.

Inflows. STA 2 currently receives water from the North New River Canal, which is pumped into the STA via the G-434 and G-435 pump stations. Runoff collected via the Hillsboro Canal is pumped into STA 2 via the S-6 pump station. In addition, runoff from agricultural lands adjacent to STA 2 is pumped into STA 2 via the G-328 pump station.

Outflows. Treated discharges from STA 2 are pumped into the L-6 Canal via the G-335 and G-436 pump stations, and then conveyed to either northern WCA 2A through a set of box culverts or to western WCA 2A through a section of degraded L-6 Canal levee. See **Figure 3-6** for a simple schematic of STA 2.

Figure 3-6 Simplified schematic of STA 2 showing major inflow and outflow structures, flow directions, and dominant/target vegetation types

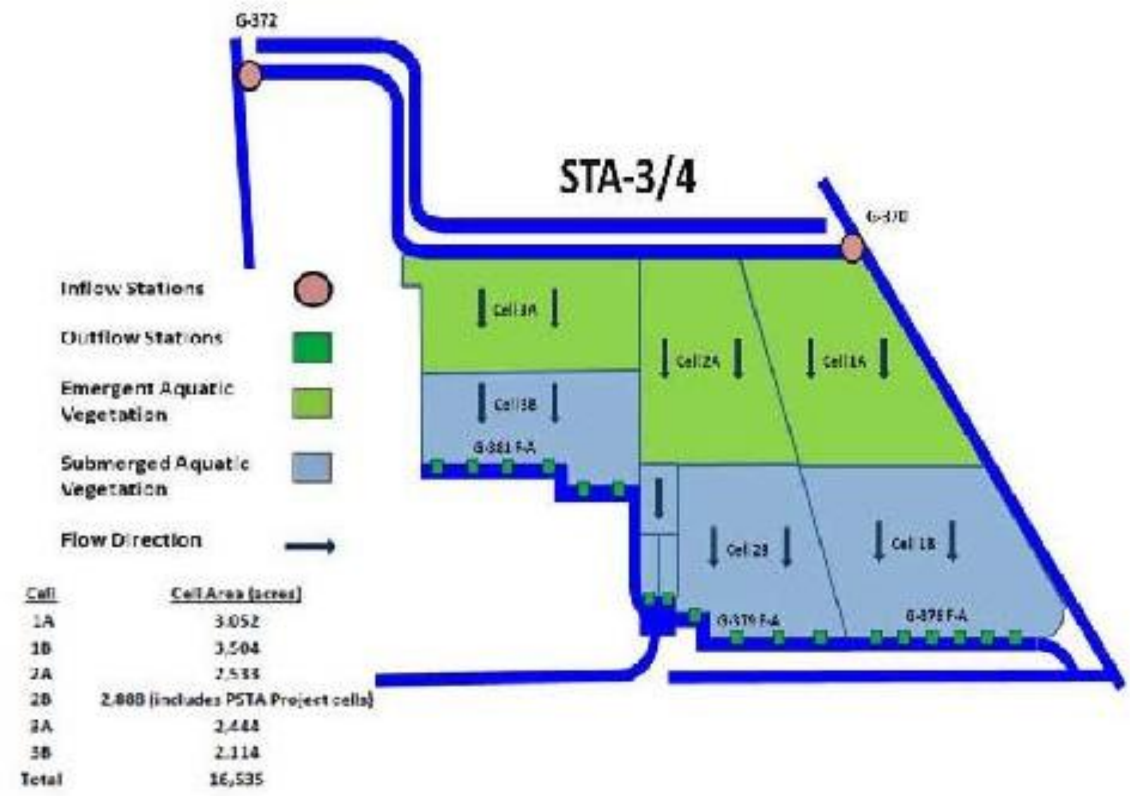


3.5.2.3 Stormwater Treatment Area 3/4

Inflows. STA 3/4 currently receives agricultural and/or urban runoff from the S-2, S-3, S-7, S-8, and C-139 Basins, the South Shore Drainage District and the South Florida Conservancy District. Runoff collected by the North New River Canal is pumped into STA 3/4 via the G-370 pump station. Runoff collected via the Miami Canal is pumped into STA 3/4 via the G-372 pump station.

Outflows. Treated discharges from STA 3/4 are conveyed to the STA 3/4 Discharge Canal and L-5 Canal, and then conveyed to either western WCA 2A via the S-7 pump station, to eastern WCA 3A via S-150, or western WCA 3A via the S-8 pump station. Pump station G-404 can also be operated to convey treated STA 3/4 discharges to the northwest corner of WCA 3A and to provide supplemental irrigation water supply to the Big Cypress Seminole Indian Reservation (in conjunction with pump station G-409). See **Figure 3-7** for a simple schematic of STA 3/4.

Figure 3-7 Simplified schematic of STA 3/4 showing major inflow and outflow structures, flow directions, and dominant/target vegetation types



3.5.2.4 Water Conservation Area 2A

Water within either the Hillsboro Canal or the North New River Canal enters into WCA 2A from STA 2 and STA 3/4 primarily through pump stations S-7 (STA 3/4), G-335 (STA 2), and G-436 (STA 2). Pump stations deliver water from the canals to the WCAs. The S-7 pump station has an adjacent gated spillway that can be opened to allow water supply deliveries from WCA 2A to the EAA. Surface water inflows to WCA 2A also enter from the Refuge through the S-10A, S-10C, and S-10D spillways located along the L-39 Levee. An interior levee (L-35B) across the southern portion of WCA 2 subdivides WCA 2A from WCA 2B. The majority of the surface water flows from WCA 2A into WCA 3A primarily through the S-11 spillways; however, a portion is released via the S-144, S-145 and S-146 structures to WCA-2B. When pool elevations in WCA 2B exceeds 11.0 feet NGVD, water is discharged from WCA 2B to the North New River Canal via spillway structure S-141.

3.5.2.5 Water Conservation Area 3A

WCA 3A receives water from Lake Okeechobee, WCA 2 and the EAA via the North New River and Miami Canals with the majority of the inflows delivered from WCA 2A through the S-11 spillways. Another large source of water entering into WCA 3A is from STA 3/4 and STA 5, which enter through the S-8 and G-404 pump stations, and the S-150 and G-357 culverts, all of which are located at the northern boundary of WCA 3A. Under high water conditions, water flows across the open portion of the western boundary of WCA 3A and into Big Cypress National Preserve. However, surface outflows are primarily made to the ENP through the S-12 spillways and the S-333 structure.

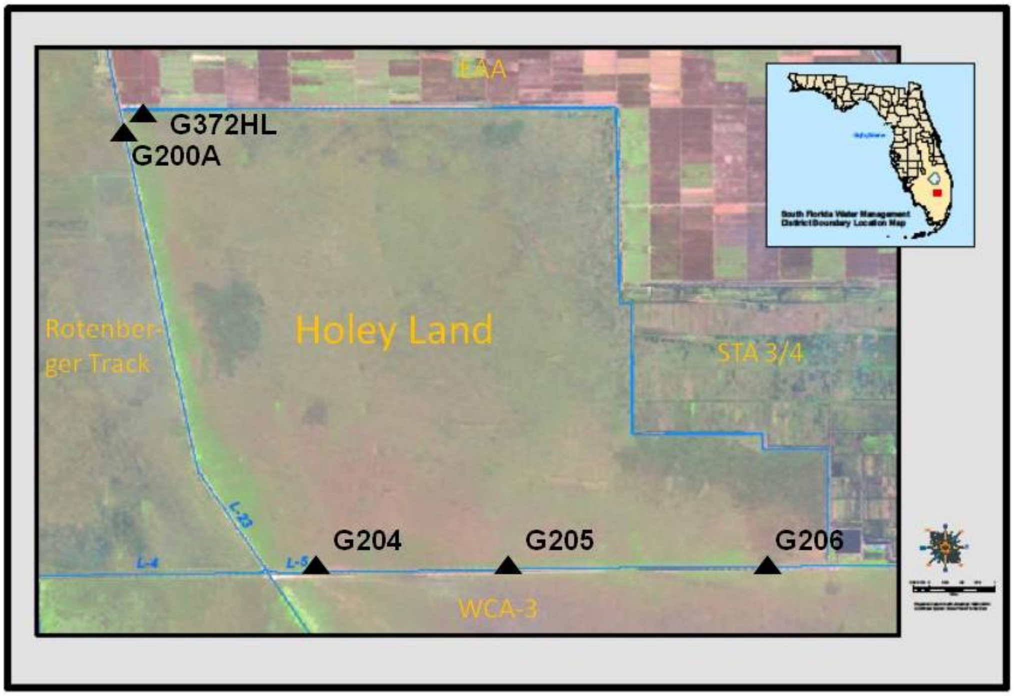
The S-140 pump station discharges runoff from the C-139 Annex, as well as the Seminole Tribe of Florida Big Cypress Reservation and the Miccosukee Tribe of Indians of Florida Reservation located along the northwestern boundary of WCA 3A. Water supply deliveries to the Seminole Tribe of Florida Big Cypress Reservation are made via the G-409 pump station located just west of the northwest corner of WCA 3A. Sources of water for this pump station include Lake Okeechobee (delivered via the G-404 pump station), STA 3/4, STA 5, STA 6, Rotenberger and Holey Land WMAs, EAA runoff, and WCA 3A.

Interior levees (L-67AC) across the southeast portion of WCA 3 subdivide WCA 3A from WCA 3B. WCA 3B receives most of its water from rainfall, but occasionally receives water supply releases from WCA 3A via the Miami and L-67 Canals (through S-151). Water is discharged from WCA 3B to the adjacent basins through the S-31 and S-337 structures via the Miami Canal, although plans are underway to enable discharges to the Northeast Shark River Slough along the northeast boundary of ENP from WCA 3B via the S-355 structures (Cooper, 1991; Grein et al., 2003; Hwa, 2003; SFWMD, 2000; SFWMD Operations, 2003; Smelt, 2003; STRIVE, 1999; and USACOE, 1999).

3.5.2.6 Holey Land Wildlife Management Area

Historically, inflows to Holey Land occurred via inflow pump station G-200A. The source of inflows was the portion of the Miami Canal (L-23, L-24 and L-25) south of STA 3/4 diversion structure G-373, which typically contains stormwater runoff that has been treated by either STA 3/4 or STA 5/6. However, in October 2005, Hurricane Wilma severely damaged G-200A, rendering it inoperable. To date, this pump station has not been replaced. As a result, limited surface water inflow capacity exists through the G-372HL box culvert located near STA 3/4 inflow pump station G-372. Outflows from Holey Land to the L-5 Canal could occur via culverts with flashboard risers (G-204, G205 and G-206) (SFWMD, 2013). However, since April 2008, there has been no surface water inflow to the Holey Land, and no outflows have occurred since January 2006. Essentially, Holey Land has become a rainfall-driven system and no longer functions as a flow-through system (**Figure 3-8**). The area dries out routinely, and re-wets depending on rainfall amounts (SFWMD, 2013).

Figure 3-8 Location of Holey Land Wildlife Management Area



3.5.3 GROUNDWATER

The Lake Okeechobee area contains a surficial aquifer system consisting of all the rocks and sediments from land surface to the top of the limestone. In the Central Flow Path, the high organic content of the soil makes the surficial groundwater generally undesirable for domestic use except close to Lake Okeechobee. This aquifer is recharged directly by two sources: Lake Okeechobee and rainfall. Lake Okeechobee provides water for a variety of consumptive demands, including urban drinking water, irrigation for agricultural lands, and recharge for wellfields.

Beneath the surficial aquifer is the Floridan aquifer system. It is the largest aquifer in Florida and the most productive in the world. This system underlies an area of approximately 100,000 square miles (258,999 km2) in Florida, southeastern Alabama, southern Georgia, and southern South Carolina. This aquifer is composed of a thick sequence of limestone layers and is divided into Upper Floridan and Lower Floridan, by a less permeable middle confining unit of carbonates. In the EAA, the water of the Floridan aquifer is rather salty, particularly in the Lower Floridan (Sprinkle, 1989).

The intermediate confining unit is located approximately 200 to 250 feet below ground surface (bgs) and will restrict any seepage from the project site that might reach this depth. There is a high degree of communication between groundwater and surface water in the area, the groundwater gradient in the surficial aquifer system is controlled, to a large extent, by the operation of the hundreds of canals throughout the region. Therefore, even though the general regional gradient in the surficial aquifer system is believed to be southward, localized gradients may actually be in other directions in portions of the area surrounding the project site due to the operation of canals and wells in the region.

3.5.4 STA PHOSPHORUS REMOVAL

Native soils within STA 2 (including Compartment B) and STA 3/4 are primarily organic muck. As dead emergent plant material is accumulated in the EAV cells, the material slowly is converted to a layer of peat soil. In submerged aquatic vegetation cells, the decomposing plant matrerials form mostly mineral soils. The accretion of new soil primarily from vegetation and detritus material in the STA occurs at a rate of approximately 1.2 ± 0.3 and 1.7 ± 0.8 cm/yr, respectively (Bhomia, Rupesh 2012).

STAs remove phosphorus from water by channeling the water through shallow marshes with either emergent wetland vegetation or submerged wetland vegetation, both of which remove phosphorus in different ways (**Figure 3-9**). For SAV-based treatment, the dominant phosphorus removal pathway binds inorganic phosphorus with soil calcium while EAV treatment enhances phosphorus storage by plant uptake and peat burial (Bhomia and Reddy 2012). Water containing inorganic phosphorus enters the wetland system. In the EAV treatment system, the wetland plants take up or absorb phosphorus from the water. As the plant material decomposes, the detritus material containing the phosphorus become sediments and provides substrata for microbial growth where phosphorus is converted to a bioavailable form. In the SAV treatment system, the limestone layer beneath the sediment absorbs or co-precipitates the phosphorus and makes it unavailable. As a whole system, phosphorus reduction in the STAs is carried out by the various physical, chemical, and biological processes, but it primarily takes place at the soil-water-plant roots interface, assisted by microbes in the water column and within the soil layer. Ultimately, the removal of phosphorus occurs as it is sequestered in the accreted soils.

STAs periodically experience dryout events as a result of drought conditions or management related activities (**Figure 3-10**). Upon re-flooding, phosphorus stored in the soils can be re-mobilized into the water column and released into downstream canals and/or wetlands (**Figure 3-11**). Several factors can potentially affect phosphorus release from STA soils. These include, but are not limited to, the degree of prior sediment enrichment, hydrologic pattern (i.e. continuously flooded versus periodic dryout), forms and concentrations of phosphorus in soil, minerals, inflow water chemistry, oxidation-reduction potential, vegetation conditions, and management activities (DeBusk and Kharbanda 2013).

Between Water Years 2002 and 2012, STA 2 experienced dryout conditions in at least five (5) water years, with approximate durations ranging from 1 to 5 months. STA 3/4 experienced dryout conditions one time since Water Year 2005, with a duration of less than one month. Below are detailed descriptions of dryout conditions for STA 2 and STA 3/4.

STA 2

Cell 1 experienced dryout conditions for approximately 3 months from mid-April 2001 through July 2001. Cell 1 experienced dryout conditions for approximately 5 months from early December 2001 through April 2002. Cell 1 experienced dryout conditions for approximately 3 months from March through May 2009. Cell 2 experienced dryout conditions for approximately 3 months from March through May 2009. Cell 1 and parts of Cell 2 experienced dryout conditions for approximately 1 month during Water Year 2011. Cell 4 experienced dryout conditions for several months in Water Year 2011, but this was related mainly to Compartment B construction activities. Cell 1 experienced dryout conditions for a brief period in June 2011. Cell 4 experienced dryout conditions for several months in Water Year 2012 related mainly to Compartment B construction activities.

STA 3/4

The Water Year 2011 dry season resulted in dryout conditions in all cells of STA 3/4 for approximately 1 month (June 2011). The dryout of SAV resulted in the near total loss of live vegetation.

Figure 3-9 STA Optimized Conditions (courtesy SFWMD presentation)

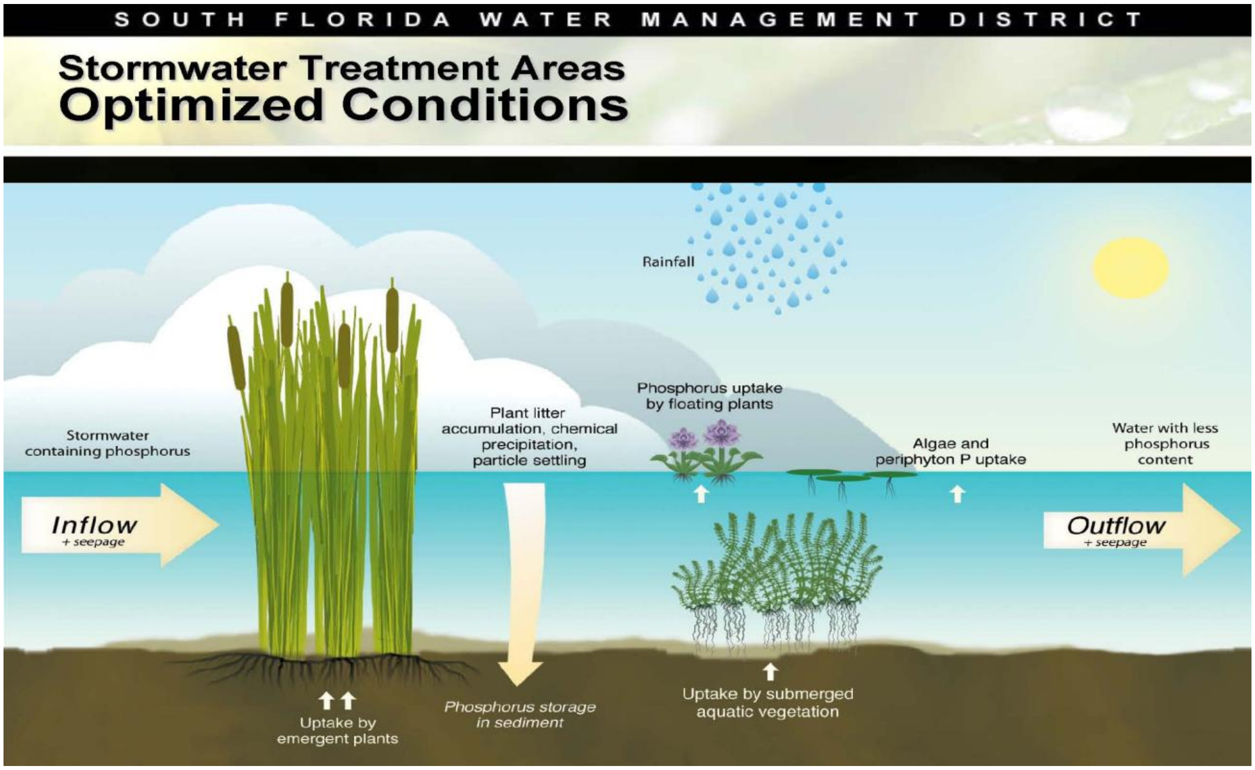


Figure 3-10 STA Dry-Out Conditions (courtesy SFWMD presentation)

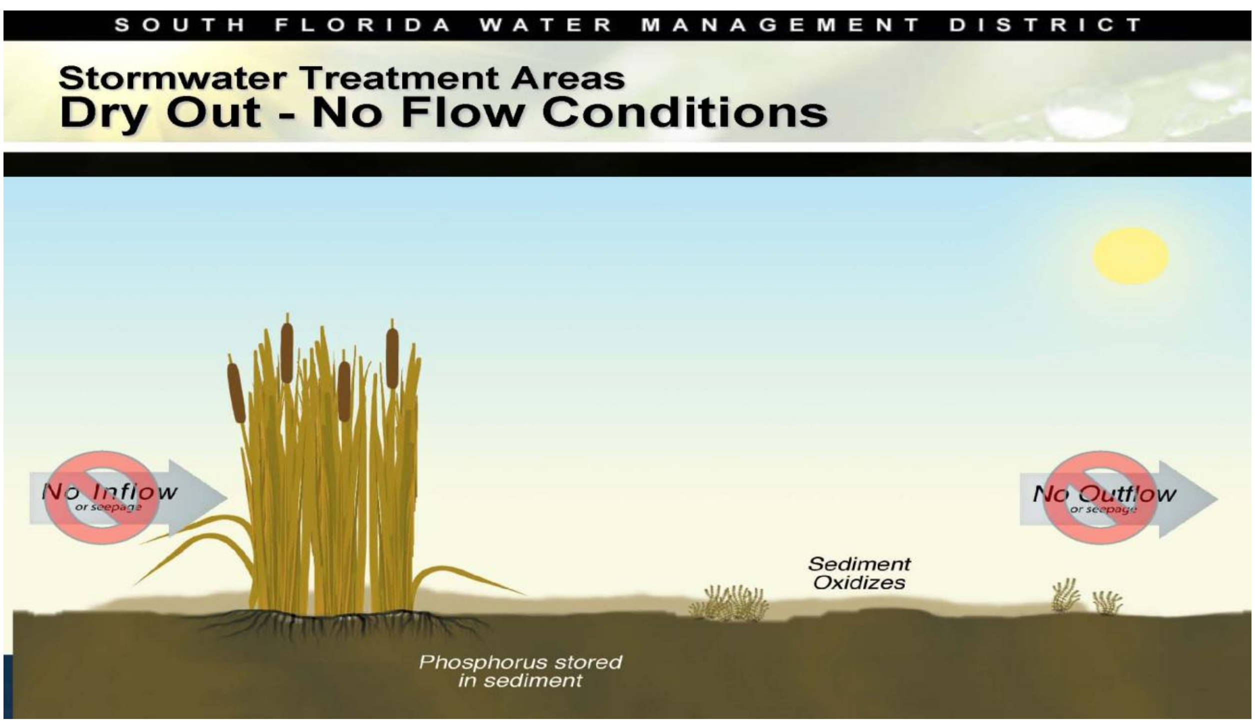
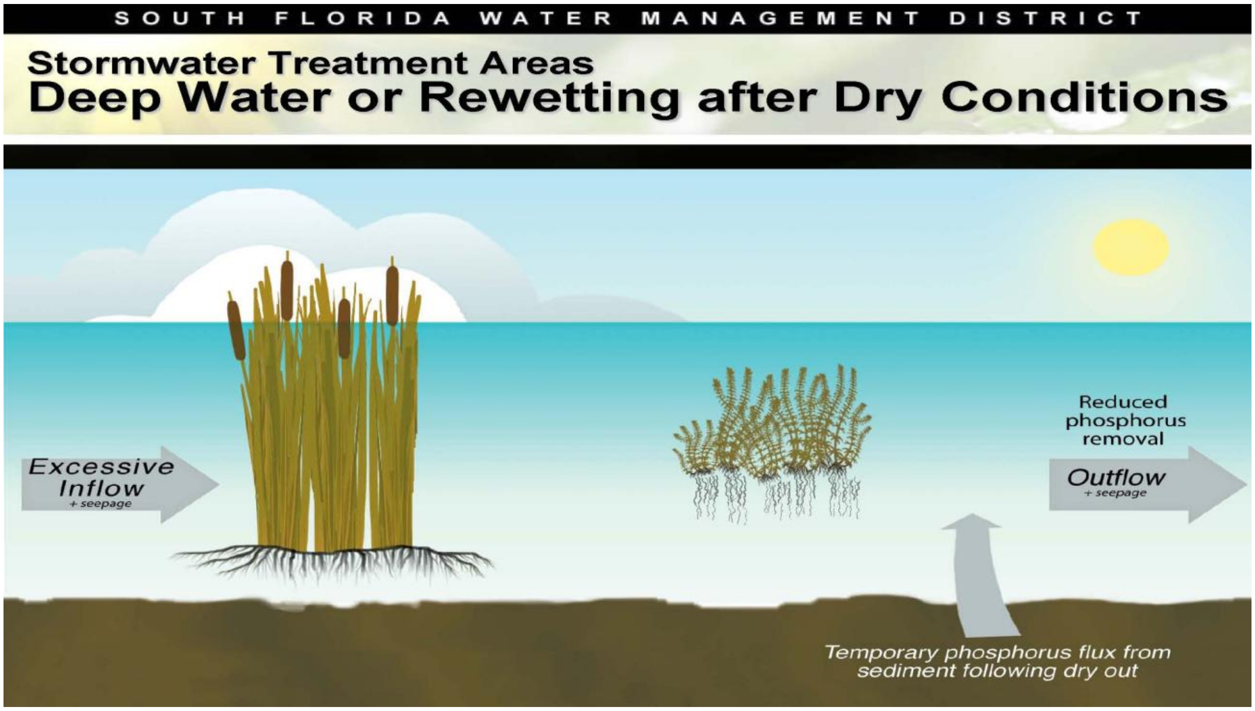


Figure 3-11 STA Re-Wetting after Dry Conditions (courtesy SFWMD presentation)



3.6 WATER QUALITY

Historically, the Everglades was an oligotrophic (or low nutrient) system. Therefore, the increased levels of nutrients present in portions of the system today have resulted in an imbalance in the native flora and fauna, for example, cattails and other invasive species displacing native sawgrass. Currently, nutrient inputs into the Everglades come primarily from agricultural fertilizers and decomposition of the peat soils, which is accelerated by continued agricultural use. While the increased concentrations of nitrogen, phosphorus, and other nutrients are a concern in the EPA, historically vegetation growth in the Everglades was limited by the comparative lack of bioavailable phosphorus. Thus, phosphorus is a parameter of particular concern in the water of Lake Okeechobee, the EAA, and the EPA.

Agricultural best management practices (BMPs) were implemented in the EAA in the 1990s, with the result of improving water quality. However, this area remains a primary source of pollutants for the WCAs. The WCAs form the remnant wetland communities for the northern section of the Everglades system. Water moving south from Lake Okeechobee and EAA is pumped through the STAs into WCAs, which are isolated by a series of levees and pump stations. Construction of STAs upstream of the WCAs serves to improve water quality conditions through time.

The focus of the water quality improvements in the Everglades is to reduce the total phosphorus concentrations in the water entering into the EPA marsh. Water quality standards are established to protect the designated use of a waterbody. The EPA waters have been designated as Class III which has the designated use of “recreation, propagation, and maintenance of healthy, well-balanced population of fish and wildlife” (62.302.540 FAC). The numeric total phosphorus criterion for Class III waters in the EPA as established in 62- 302.540 FAC is 10 parts per billion (ppb) measured as a long-term geometric mean. Achievement of the 10 ppb criterion in the Refuge and WCAs 2 and 3 is dependent on the total phosphorus (TP) concentrations in the water leaving the EAA. The 10 ppb criterion is applied using an achievement methodology that takes into account spatial and temporal variability, which is described below.

Achievement of the criterion in impacted and unimpacted areas of the Refuge, WCA 2 and WCA 3 is determined based upon data from stations that are evenly distributed and located in freshwater open water sloughs similar to the areas from which data were obtained to derive the phosphorus criterion. Determining achievement of the criterion is based on data collected monthly from the network of monitoring stations in both the impacted and unimpacted areas. The waterbody is assessed for attainment of the criterion as determined by a four-part test. In order to provide protection against imbalances of aquatic flora or fauna, the following provisions must all be met:

a. The 5-year geometric mean averaged across all stations is less than or equal to 10 ppb;
b. The annual geometric mean averaged across all stations is less than or equal to 10 ppb for 3 of 5 years;
c. The annual geometric mean averaged across all stations is less than or equal to 11 ppb; and
d. The annual geometric mean at all individual stations is less than or equal to 15 ppb.

Assessment of the phosphorus criterion within the Everglades indicates that the 4-part test is typically met in the unimpacted portions of each WCA, while the impacted portions of each WCA fail one or more parts of the test and therefore exceed the criterion. (SFWMD 2012).

3.6.1 PROJECT SITE

Water quality data at the project site are not available, but is anticipated to be similar to that of other fallow cropland in the EAA. It is reasonable to assume that phosphorus levels in the soil and in runoff would be lower than active agricultural activities, but higher than sites not previously farmed.

3.6.2 STA 2 AND STA 3/4

The original STA 2 consisted of three treatment cells (1, 2, & 3) with approximately 6,400 acres of effective treatment area and began operation in 2000. The treatment area was expanded by approximately 1,900 acres with the construction of Cell 4, which was flow capable by December 2006. However, this cell went off-line in Water Year (WY) 2010 (water budget standard duration measured between May 1, 2009 and April 30, 2010) for Compartment B construction. Compartment B construction was completed in December 2011 and was permitted to operate in September 2012, adding approximately 7,000 acres of treatment area. The STA 2/Compartment B complex has a total of eight treatment cells, five flow-ways, and a total effective treatment area of approximately 15,000 acres. (**Figure 3-6**).

STA 3/4 consists of six treatment cells (1A, 1B, 2A, 2B, 3A and 3B) and the Periphyton-based STA (PSTA) Implementation Project cells (Upper SAV, Lower SAV and PSTA). STA 3/4 has 16,300 acres of effective treatment area and began operation in 2003 (**Figure 3-7**).

Average annual TP concentrations of inflows to and outflows from STA 3/4 and STA 2 are shown in **Table 3-1**. Since STA 3/4 began operation in October 2003, it has treated approximately 3.7 million acre-feet (ac-ft) of runoff, retaining 440 metric tons (mt) of TP, and reducing TP concentration from 114 parts per billion (ppb) to 18 ppb. Since STA 2 began operation in October 2003, it has treated approximately 2.7 million acre-feet of runoff, retaining over 269 metric tons of TP, and reducing TP concentration from 103 ppb to 22 ppb flow weighted mean concentration (FWMC). While improvements have been observed, these STA outflow concentrations still exceed the WQBEL criterion of 13 ppb, which is the concentration required at the STA discharge in order to prevent further phosphorus enrichment in the EPA.

Table 3-1 STA performance for the period of record from STA operational start date - WY2012.

STA	Start Date	Inflow Volume (ac-ft)	Inflow TP FWMC to date (ppb)	TP retained to date (mt)	Outflow TP FWMC to Date (ppb)
STA 2*	June 1999	2,764,250	103	269	22
STA 3/4	Oct. 2003	3,719,561	114	440	18

*Data for the Compartment B expansion is not included as it was not completed until WY2013.

Due to the complexity of the STAs, the many operational challenges, and the demand to achieve and sustain low TP outflow concentrations, the SFWMD has performed and continues to conduct scientific investigations and research with the goals of enhancing knowledge of the complex treatment systems, the factors affecting performance, and the various TP removal mechanisms in the STAs. The research projects and results are presented annually in the South Florida Environmental Reports (SFERs) (available at www.sfwmd.gov/sfer). It is evident, however, that maintaining minimum stages to keep the STAs hydrated and to ensure the viability of EAV and SAV, and regulating inflows to minimize high hydraulic loading rates improves their performance.

3.6.3 WATER CONSERVATION AREAS

The geometric mean of measured TP concentrations (in ppb) in the WCAs over the 2005 to 2011 period of record is summarized in **Table 3-2**. The inflow and outflow concentrations are based on total inflows and total outflows to the WCA. As the outflow from the STA is discharged in the canal, the treated water mixes with the untreated water in the canal, and can enter into the WCA. As not all of the canal water is treated by the STA and not all of the treated water enters the WCAs, the TP concentrations in the outflow from the STA are different from the concentrations in the inflow in the WCAs. **Figure 3-12** and **Figure 3-13** show the location of the water quality monitoring stations in WCA 2A and WCA 3A, respectively.

Table 3-2 WY2005 to WY2011 Geometric Mean TP Concentrations (ppb)

WCA	Inflow	Interior	Outflow
WCA 2A	21.1	12.0	13.9
WCA 3A	23.0	7.5	12.8

Decreases in interior marsh TP concentrations in recent years have been observed for WCA 2A and WCA 3A (**Table 3-3**). The continued decreases in TP concentration observed in WCA 2 and WCA 3 likely reflect recovery from the recent climatic extremes, improved treatment of the inflows to these areas (which is supported by similar decreases in inflow concentrations), and improved conditions in the impacted portions of the marsh (SFWMD 2012). This includes the area downstream of the S-10 structures located along the L-39 levee between WCA 2A and WCA 1, which is one of the area's most highly impacted by historical phosphorus enrichment (**Figure 3-14**). This area is also where the quantity of discharge has been significantly reduced and the quality of the discharge has improved since STA 2 began operation.

Figure 3-12 Location and classification of water quality monitoring stations in WCA 2

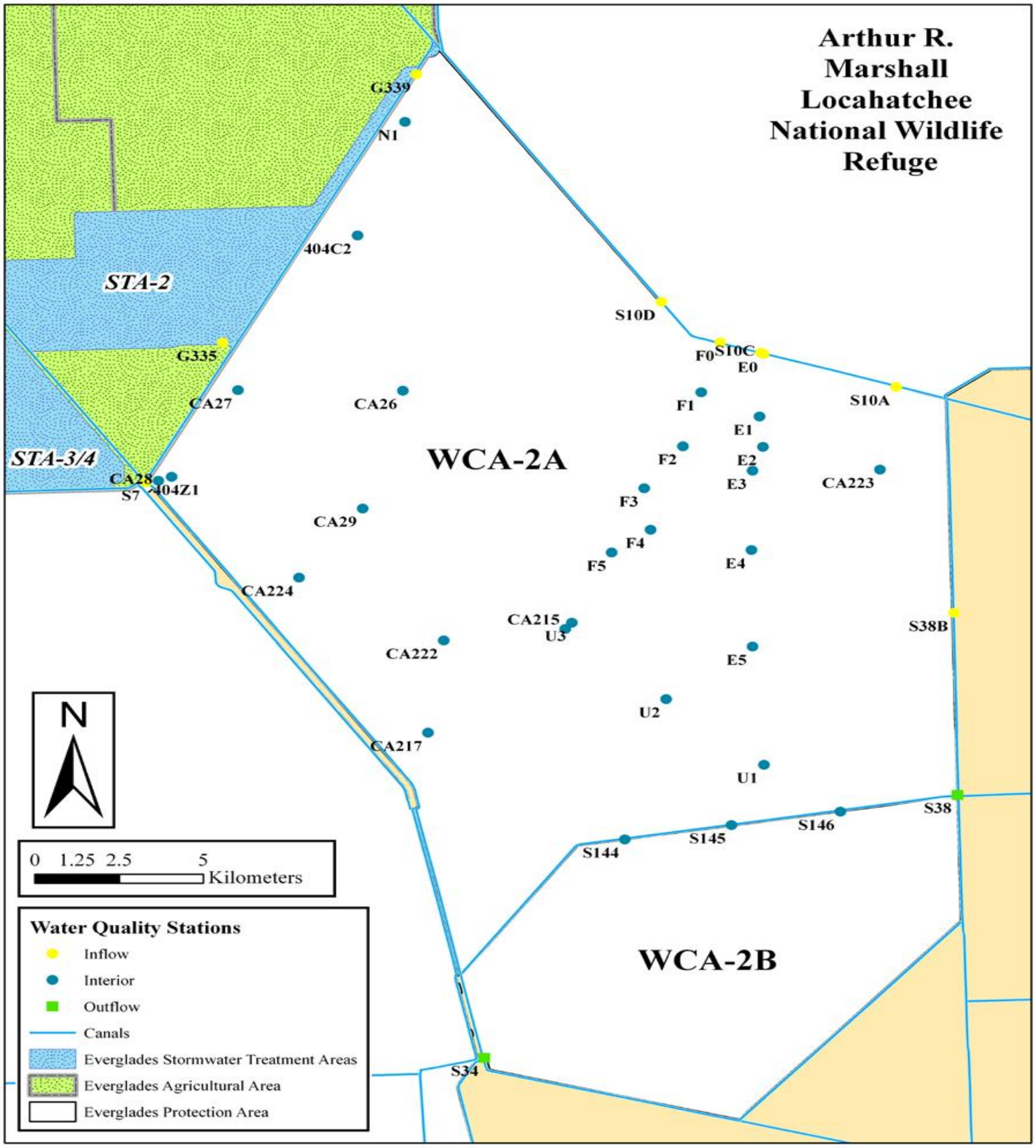


Figure 3-13 Location and classification of water quality monitoring stations in WCA 3

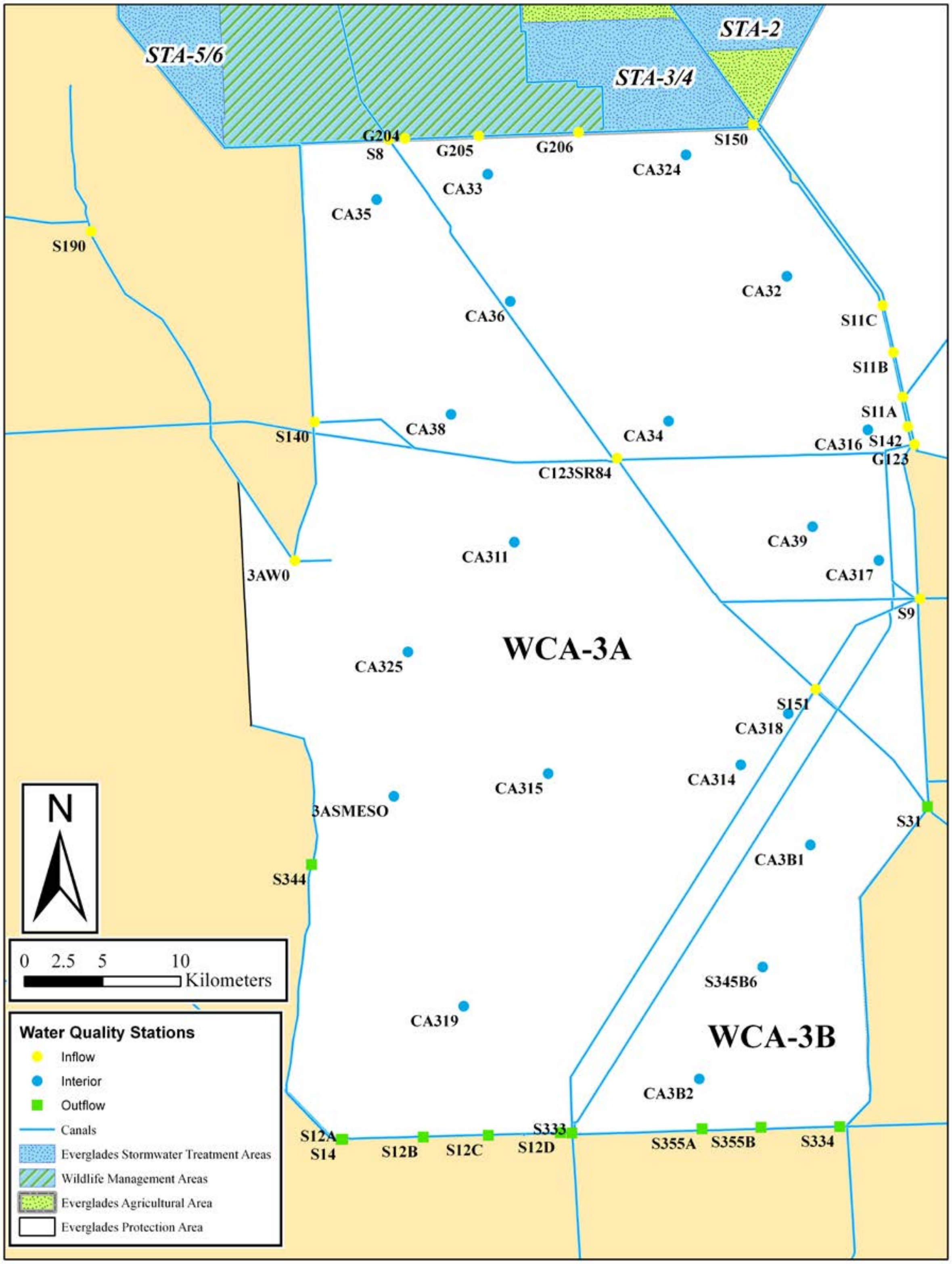


Figure 3-14 Phosphorus Impacted Areas in the Everglades Protection Area

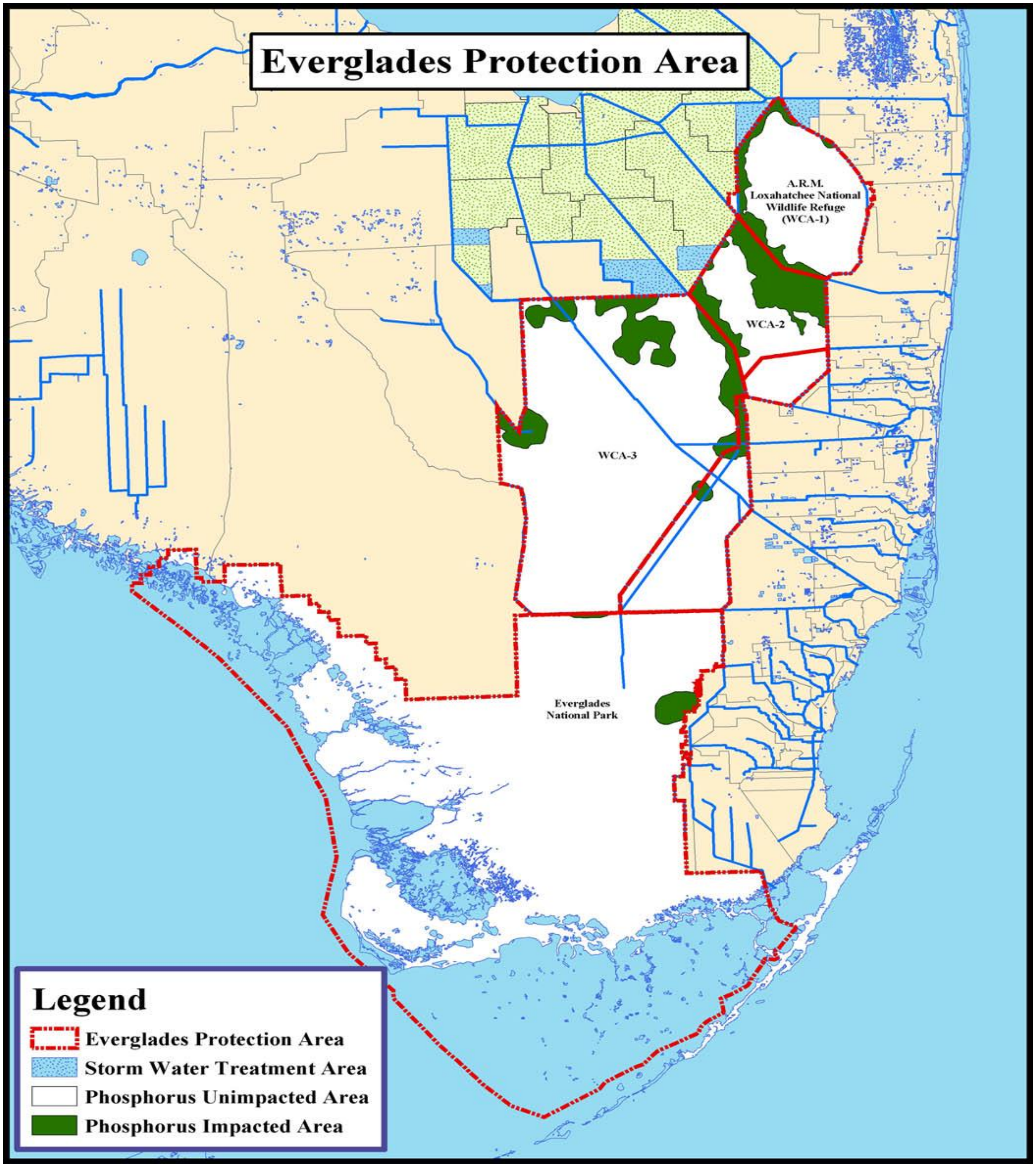


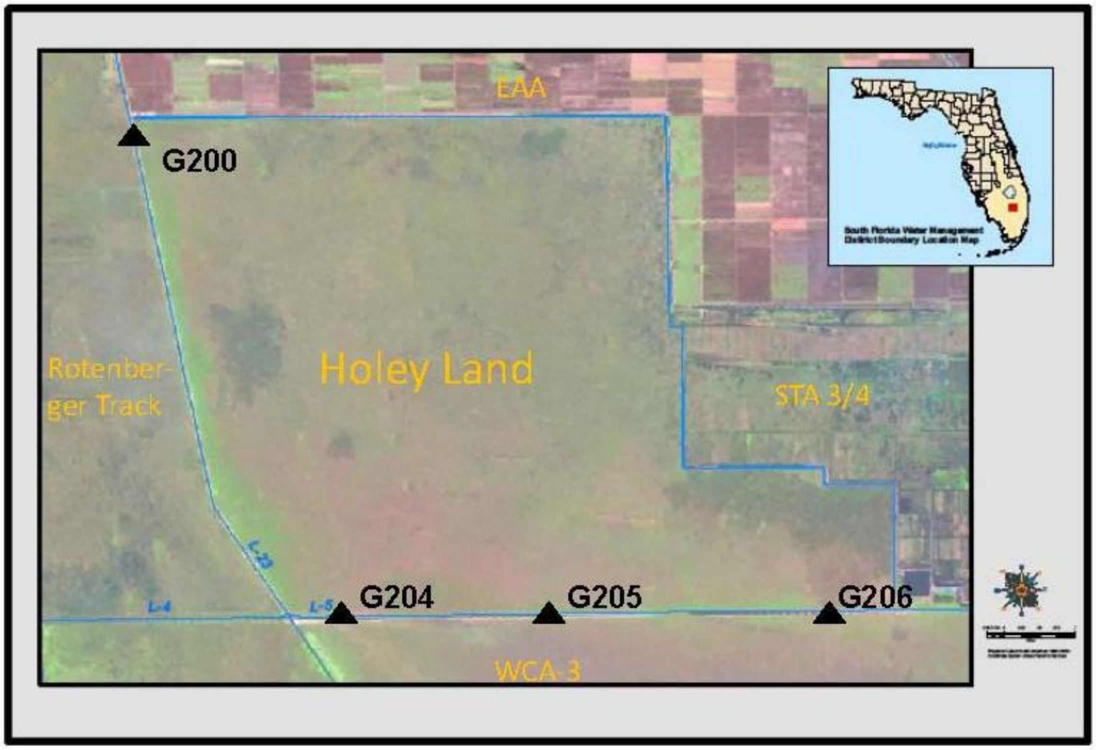
Table 3-3 Total phosphorus concentrations (ppb) for the periods WY1979-WY1993, WY1994-WY2004, WY2005-2011 and WY2012

		Geometric Mean		Median	
		WCA 2A	**WCA 3A**	**WCA 2A**	**WCA 3A**
Inflow	1979-1993	69.8	37.4	68.0	37.0
	1994-2004	45.0	31.5	49.0	30.0
	2005-2011	21.1	23.0	18.0	21.0
	2012	15.3	21.9	13.5	21.0
Interior	1979-1993	16.2	10.2	13.0	10.0
	1994-2004	16.9	8.1	14.0	7.0
	2005-2011	12.0	7.5	10.0	7.0
	2012	8.9	6.3	8.0	6.0
Outflow	1979-1993	23.2	12.1	23.0	11.0
	1994-2004	17.6	10.1	17.0	10.0
	2005-2011	13.9	12.8	13.0	11.3
	2012	14.0	14.7	13.0	13.0

3.6.4 HOLEY LAND WILDLIFE MANAGEMENT AREA

Since 2008, there have been no surface water inflows to or outflows from Holey Land. Due to the lack of surface water flows, SFWMD has collected limited water quality samples from ponded water at the G-204, G-205, and G-206 (**Figure 3-15**). The results (October 1, 2010 to September 30, 2011) show total phosphorus concentrations ranging from 20 ppb to 32 ppb, with an average concentration of 25 ppb at G-200, 48 ppb to 206 ppb, with an average concentration of 117 ppb at G-204, 30 ppb to 72 ppb, with an average concentration of 48 ppb at G-205, and 12 ppb to 31 ppb, with an average concentration of 24 ppb at G-206- (SFER 2013). Higher nutrient levels were observed at G204, which dries out more frequently than G205 and G206, due to the higher topography of the location.These values are indicative of water column concentrations within these pools and may not be representative of the marsh water quality.

Figure 3-15 Holey Land Water Quality Monitoring Locations



3.7 VEGETATION

3.7.1 PROJECT SITE

The project site contains 16,517.9 acres of land, of which 14,656.9 acres are waters of the US and 1,861 acres are uplands. The waters of the US consists of 9,950.4 acres of mixed scrub shrub wetlands (exotic regraded wetlands), 203.2 acres of exotic scrub shrub wetlands (exotic dominated wetlands), 3,908.5 acres of herbaceous freshwater marsh wetlands (scraped area wetlands), 97.6 acres of borrow areas, and 498.1 acres of channelized waterway (other surface waters).

The uplands consist of existing levees and areas that have been previously filled to store rock material and muck soils. The exotic degraded wetlands (9,950.4 acres) are areas that previously contained sugar cane vegetation. Since active sugarcane cultivation has ceased in 2009, these wetland areas have gone fallow. Sugar cane vegetation is no longer present and wetland vegetation has recruited back into the area. These areas, which are in an altered condition, contain plant species such as Carolina willow or often just referred to as willow (Salix caroliniana), wand goldenrod (*Solidago stricta*), bushy broomsedge (*Andropogon glomeratus*), salt bush (*Baccharis glomerulifolia*), elephant grass (*Pennisetum purpureum)*, primrose willow

(*Ludwigia peruviana*) and cattail (*Typha spp.*). Standing water was not observed in these areas during a site visit in October 2012.

The 203.2 acres of wetland that were high quality depressional wetlands in 2005 are now in a highly degraded condition with 90% nuisance and exotic species such as Elephant grass and castor bean (*Ricinus communis*). These areas did not contain standing water during a site visit in October 2012. [See Florida Department of Environmental Protection (FDEP) field trip report in Appendix C for details.] The 3,908.5 acres of freshwater marsh wetlands were previously scraped down during construction activities for the A-1 Reservoir. These areas are considered higher quality wetlands as compared to the exotic dominated wetland areas and exotic degraded wetlands because they contain a dominance of native plant species including water-primrose (*Ludwigia peruviana*), bushy aster (*Aster dumosus*), marsh fleabane (*Pluchea rosea*), flat-sedge (*Cyperus spp.*), jointed spikerush (*Eleocharis interstincta*), and water-hyssops (*Bacopa caroliniana*). Also these areas contained standing water during the site visit in October 2012.

The waters of the US include 96.7 acres of borrow areas and 498.1 acres of channelized waterway. Spatter-dock (*Nuphar spp*.) and water lettuce (*Pistia Stratiotes*) were found floating on the surface of the canals and ditches. Refer to Chapter 5 to review the SFWMD's Uniform Mitigation Assessment Methodology (UMAM) wetland function and value scores for existing site conditions.

3.7.2 STA 2 AND STA 3/4

Cells within the STA's are designed for either EAV or SAV and open water areas. The dominant submerged aquatic vegetation species include *Najas* sp. (water-nymph) and *Chara* (muskgrass), a gray-green branched multicellular algae, while the dominant emergent aquatic vegetation is cattail (*Typha domingensis*).

Maintaining water depths at levels optimal to cattail growth and survival is an important management strategy in the STAs. Changes in hydrologic regimes in a marsh can have subtle to drastic effects on cattail (Chen et al., 2010). Cattail species can be eliminated under extended periods of deeper water level conditions (Appelbaum, 1985 as cited in Chen 2013; Sojda and Solberg, 1993 as cited in Chen 2013). Extended deepwater conditions can cause the formation of cattail floating mats in the STAs (Chen et al., 2010). Heavy hydraulic loading, particularly during storm events, has impacted cattail coverage and density in EAV cells.

Dry-outs have less effect on cattails than SAV as cattails can survive short periods of dry-out. Lowering water levels to near ground level for a moderate time improves cattail recruitment and establishment (Chen 2013); however long periods of complete dry-out can also result in cattail mortality. In SAV cells, dryout events typically have adverse effects on the vegetation and potentially alter the community characteristics following rehydration. Dry-out of SAV cells leads to die off of the SAV and the associated periphyton communities essential to phosphorus sequestration. For example, an STA 3/4 central flow-way dryout/re-flood event in 2011 resulted in a dramatic change in the SAV community from a water-nymph and muskgrass co-dominated to a muskgrass dominated system. (DeBusk and Kharbanda 2013)

3.7.3 WATER CONSERVATION AREAS 2A AND 3A

Almost all of the WCAs are grass-dominated wetlands interspersed with tree islands (hammocks) and Carolina willow strands. Tree islands are a unique feature of the Everglades ecosystem. In general, there are two recognizable types of basin wetland communities present in the WCAs:

1. Sawgrass ridge composed of primarily of sawgrass (*Cladium jamaicense*) with cattail (Typha spp.), maidencane (*Panicum hemitomon*), arrowhead (*Sagittaria* sp.), pickerelweed (*Pontederia cordata*), Carolina willow, buttonbush (*Cephalanthus occidentalis*), wax myrtle (*Myrica cerifera*), and saltbush.
2. Slough communities, composed of spikerush (*Eleocharis* spp.), white water lily (*Nymphaea odorata*), SAV and periphyton.

There are also forested wetlands within the WCAs, which include tree islands. The composition of tree island plant communities vary from island to island but a relatively small number of plant communities are widely distributed across the landscape of the central Everglades. Despite some north–south landscape stratification in tree islands, at least six identified canopy communities are present in all tree island that were surveyed, which is an indication that the forest canopy of elevated tree islands is relatively similar throughout the central Everglades. The six canopy communities are:

1) Fig Canopy
2) Diverse Forest
3) Pond Apple Canopy
4) Willow Mix
5) Willow Canopy
6) Coco plum Canopy

The dominant canopy species identified fall into two broad categories: very flood intolerant species and species that tolerate a wide hydrologic range. The dominant species of the Fig and Diverse Forest communities, Ficus aurea, Schinus terebinthifolius, Cocoloba diversiflora, Bursera simaruba, and Celtis laevigata, were found in all island groups and in 29% of the plots surveyed. Most of the dominant species of these two canopy communities are species known to be flood intolerant with optimum annual hydroperiods of less than 60 days (Sah 2004). Species with broad hydrologic tolerances (200 to 310 days; Sah 2004) include Annona glabra, Salix caroliniana, and Chrysobalanus icaco, which were dominant in the Pond Apple, Willow Canopy, and Coco Plum plant communities and recorded in 77% of the plots. Chrysobalanus icaco has a hydrologic tolerance of 50–240 days per year, one of the longest hydroperiod ranges of the common tree island species (Sah 2004).

In general, woody species with wide hydroperiod tolerances were more common than were species requiring shorter hydroperiods. Because of the highly altered hydrology caused by water management in the current Everglades, it is not clear whether this finding reflects a natural pattern of wetland forests or is the result of human-caused hydroperiod increases in the last several decades. The canopy communities of the tree island heads of the studies tree islands were qualitatively described in the 1970s and early 1980s and provide a partial idea of how the vegetation canopy communities have changed during the past 25 to 30 years (McPherson 1973; Alexander and Crook 1975; Zaffke 1981; Wetzel 2002a).

Although the vegetation descriptions are limited, the canopy communities located on islands in the middle of WCA 3A or 3B appear to have changed little in 25 years (Alexander and Crook 1975; Wetzel 2002a). Species richness was similar and the same species were present at both time periods. However, for two islands in southern WCA 3A the tree island canopy communities appear to have shifted toward a greater dominance of species with broad water tolerances. Comparison of the data from this study and descriptions from Alexander and Crook (1975) and McPherson (1973) suggest that canopy species such as A. glabra and S. caroliniana increased and other water intolerant species, such as Ficus aurea, Myrsine guianensis, and Persea borbonia became less common on these two islands. If such a shift in canopy species has occurred on these two islands it may be the result of increased water levels caused by the levees that have impounded water in southern WCA 3A since the 1960s. Extreme hydrologic patterns, a history of human camps, and severe fires are important environmental drivers for tree island head forest composition, but there are other possible factors not measured that could influence forest composition, including competitive exclusion from non–native species, patterns of seed dispersal (Gawlik and Rocque 1998), and interspecific competition. In addition, the data cannot reflect the loss of plant species (or community associates) that occurred prior to the sampling efforts.

High nutrient concentrations have resulted in widespread changes to the ecology of the Everglades, including invasion of cattail. The proliferation of cattail in the Everglades is attributed to increased phosphorus levels in the soil and increased water depth and duration of flooding (Newman et. al. 1998). Monospecific stands of cattail have replaced the historic sawgrass marsh ridge and slough landscape over nearly 12,500 hectares (30,888 acres) in the Everglades (SFWMD 2012).

Vegetation maps provided in the following sections were produced by the SFWMD utilizing color infrared aerial photography. Data sets were ground-truthed and vegetation types delineated and classified using the Vegetation Classification for South Florida Natural Areas (Rutchey et al. 2006).

Major plant communities in WCA 2A now consist of remnant tree islands, open water sloughs, large expanses of sawgrass, and sawgrass intermixed with dense cattail stands. Remaining tree islands are found primarily at higher ground level elevations, located in the northwest corner of WCA 2A. Remnant tree islands, dominated primarily by Carolina willow, are found scattered throughout the central and southern sections of WCA 2A. Cattail distribution in WCA 2 reflects 4,400 acres in which cattails represent more than 50% of the vegetation coverage and 24,000 acres of mixed or scattered cattail (<50% coverage) present in the northeast portion of WCA 2A (USACE 2009).

Several studies conducted within WCA 2A show that cattail out-compete sawgrass in their ability to absorb excess nutrients with increased cattail production during years of high nutrient inflows (Toth, 1988; Davis, 1991). Cattail is considered a high nutrient status species that is opportunistic and highly competitive, relative to sawgrass, in nutrient-enriched situations (Toth, 1988; Davis, 1991). Davis (1991) concluded that both sawgrass and cattail increased annual production in response to elevated nutrient concentrations, but that cattail differed in its ability to increase plant production during years of high nutrient supply.

The community structure and species diversity of Everglades vegetation located north of I-75 (WCA 3A North) is very different from the wetland plant communities found south of I-75 (WCA 3A South). Improvements made to the Miami Canal and the impoundment of WCA 3A by levees have over-drained the north end of WCA 3A and shortened its natural hydroperiod. These hydrological changes have increased the frequency of severe peat fires that have resulted in loss of tree islands, aquatic slough, and wet prairie habitat that were once characteristic of the area. Today, northern WCA 3A is largely dominated by sawgrass and lacks the natural structural diversity of plant communities seen in southern WCA 3A.

Over-drainage of the northwestern portion of WCA 3A has allowed the invasion of a number of terrestrial species such as saltbush, dog fennel (*Eupatorium sp*.), and broomsedge (*Andropogon* *glomeratus*). Melaleuca (*Melaleuca quinquenervia*) has become well-established in the southeastern corner of WCA 3A, and is spreading to the north and west.

Vegetation located in the central and southern portion of WCA 3A represents some of the best examples of original Everglades habitat left in South Florida. This region of the Everglades appears to have changed the least since the 1950s, and contains a mosaic of tree islands, wet prairies, sawgrass stands, and aquatic sloughs.

A comparison of vegetation in WCA 3 vegetation maps from 1995 to 2004 (SFWMD 2011) indicate an increase in sawgrass/shrub by 48 percent (9,566 acres to 14,179 acres, 30 percent increase in broadleaf marsh (2,775 acres to 3,593 acres), while floating marsh decreased by 37 percent (8,948 acres to 5,632 acres) (See **Figure 3-16**). Most significant may be the trend in cattail coverage which increased 38% within WCA 3, representing a state change from historic ridge and slough patterns (SFWMD 2011 and 2013) (**Figure 3-17**).

3.7.4 HOLEY LAND WILDLIFE MANAGEMENT AREA

The vegetation community structure was historically dense sawgrass with scattered wetland tolerant shrubs and sloughs (Davis, 1943); however, anthropogenic alterations of the hydropattern have caused significant shifts in the plant community structure (Cornwell and Hutchinson, 1974). Wet prairie and slough vegetative habitats are present in the northeast and southwest reaches. Carolina willow is encroaching into the marsh along the Holey Land's western and southern boundaries.

Cattails are also prevalent throughout the Holey Land. The ground elevation within Holey Land varies as much as four feet. This elevation range is primarily the result of muck fires burning away organic soil during extreme dry periods. Extended high water levels in Holey Land can drown out typical marsh species in these deep pockets, creating an opening in the landscape susceptible to invasion by cattail (Newman et al. 1998). The FWCC performs cattail monitoring in Holey Land (SFWMD, 2011). The results of the 2011 survey estimate that 18% (6,300 acres) of the area is covered by cattail. This indicates an increase in estimated cattail coverage from 2010 (which was 10% of the area); however, it is still significantly less than what was estimated in 2004 at 27% coverage of the area.

Figure 3-16. Dominant vegetation types in found in 1995 and 2004 WCA 3 vegetation mapping (SFWMD 2011).

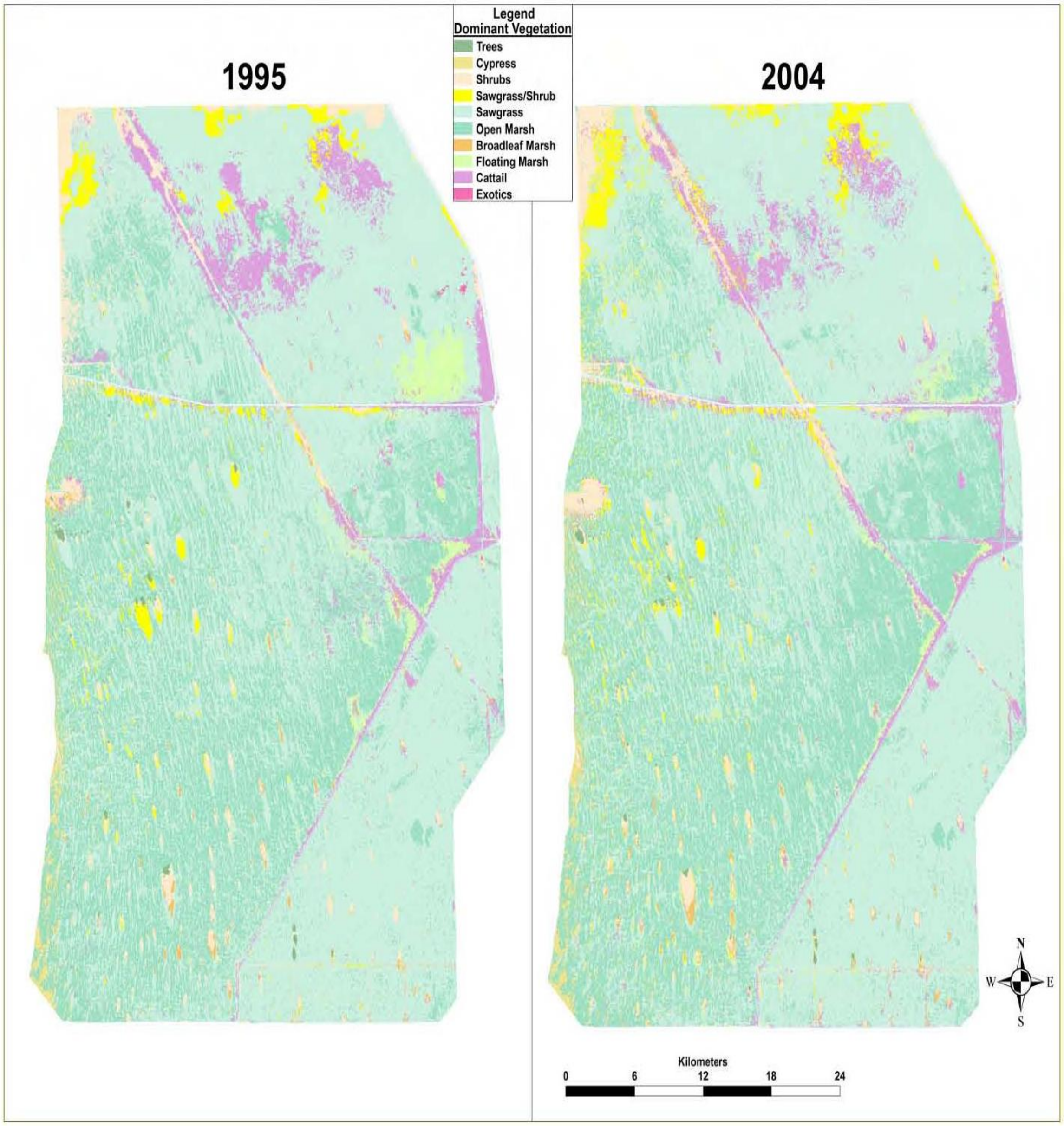
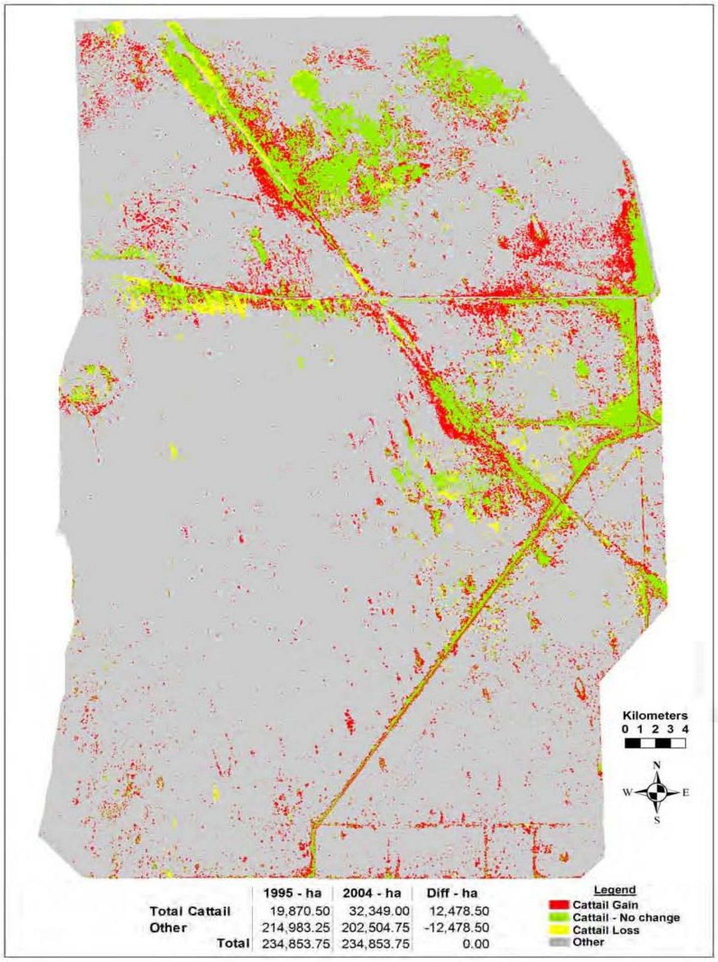


Figure 3-17 Map depicting gain, loss, and no change in cattail coverage within WCA 3



	1995 - ha	2004 - ha	Diff - ha
Total Cattail	19,870.50	32,349.00	12,478.50
Other	214,983.25	202,504.75	-12,478.50
Total	234,853.75	234,853.75	0.00

3.8 FISH AND WILDLIFE

3.8.1 GENERAL FISH AND WILDLIFE SPECIES

3.8.1.1 Overall area

Aquatic macroinvertebrates form a vital link between the algal and detrital food web base of freshwater wetlands and the fishes, amphibians, reptiles, and wading birds that feed upon them. Important macroinvertebrates of the freshwater aquatic community include crayfish (*Procambarus alleni*), riverine grass shrimp (*Palaemonetes paludosus*), amphipods (*Hyallela aztecus*), Florida apple snail (*Pomacea paludosa*), Seminole ramshorn (*Planorbella duryi*), and numerous species of aquatic insects (USACE 1999a).

Small freshwater marsh fishes are also important processors of algae, plankton, macrophytes, and macroinvertebrates. Marsh fishes provide an important food source for wading birds, amphibians, and reptiles. Common small freshwater marsh species include the golden topminnow (*Fundulus chrysotus*), least killifish (*Heterandria formosa*), Florida flagfish (*Jordenella floridae*), golden shiner (*Notemigonus crysoleucas*), sailfin molly (*Poecilia latipinna*), bluefin killifish (*Lucania goodei*), oscar (*Astronotus ocellatus*), eastern mosquitofish (*Gambusia holbrookii*), and small sunfishes (*Lepomis* spp.) (USACE 1999a). The density and distribution of marsh fish populations fluctuates with seasonal changes in water levels. Populations of marsh fishes increase during extended periods of continuous flooding during the wet season. As marsh surface waters recede during the dry season, marsh fishes become concentrated in areas that hold water through the dry season, such as alligator holes, limestone solution holes, and longer-hydroperiod marshes and sloughs. Concentrated dry season assemblages of marsh fishes are more susceptible to predation and provide an important food source for wading birds (USACE 1999a).

Numerous sport and larger predatory fishes occur in deeper canals and sloughs. Common species include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), black crappie (*Pomoxis nigromaculatus*), Florida gar (*Lepisosteus platyrhincus*), threadfin shad (*Dorosoma petenense*), gizzard shad (*Dorosoma cepedianum*), yellow bullhead (*Ameiurus natilis*), white catfish (*Ameiurus catus*), bowfin (*Amia calva*), and tilapia (*Tilapia* spp.) (USACE 1999a). Larger fish are an important food source for raptors and other birds of prey, wading birds, alligators, otters, raccoons, and mink.

The freshwater wetland complex supports a diverse assemblage of reptiles and amphibians. Common amphibians include the greater siren (*Siren lacertina*), Everglades dwarf siren (*Pseudobranchus striatus*), two-toed amphiuma (*Amphiuma means*), pig frog (*Rana grylio*), southern leopard frog (*Rana sphenocephala*), Florida cricket frog (*Acris gryllus*), southern chorus frog (*Pseudacris nigrita*), squirrel tree frog (*Hyla squirela*), and green tree frog (*Hyla cinerea*) (USACE 1999). Amphibians represent an important forage base for wading birds, alligators, and larger predatory fishes (USACE 1999a).

Common reptiles of freshwater wetlands include the American alligator (*Alligator mississippiensis*), snapping turtle (*Chelydra serpentina*), striped mud turtle (*Kinosternon bauri*), mud turtle (*Kinosternon subrubrum*), cooter (*Chrysemys floridana*), Florida chicken turtle (*Deirochelys reticularia*), Florida softshell turtle (*Trionys ferox*), water snake (*Natrix sipidon*), green water snake (*Natrix cyclopion*), mud snake (*Francia abacura*), and Florida cottonmouth (*Agkistrodon piscivorus*) (USACE 1999a). The alligator was historically most abundant in the peripheral Everglades marshes and freshwater mangrove habitats, but is now most abundant in canals and the deeper slough habitats of the central Everglades, the STAs, WCAs and the Holey Lands. Drainage of peripheral wetlands and increasing salinity in mangrove wetlands as a result of decreased freshwater flows has limited the occurrence of alligators in these habitats (Mazzotti and Brandt 1994).

The freshwater wetlands of the STAs, WCAs and the Holey Land are noted for their abundance and diversity of colonial wading birds. Common wading birds include the white ibis (*Eudocimus albus*), glossy ibis (*Plegadus falcenellus*), great egret (*Casmerodius albus*), great blue heron (*Ardea herodius*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), snowy egret (*Egretta thula*), green-backed heron (*Butorides striatus*), cattle egret (*Bubulcus ibis*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*Nycticorax violacea*), roseate spoonbill (*Ajaia ajaja*), and wood stork (*Mycteria americana*) (USACE 1999a).

The Everglades National Park (ENP) historically supported the largest number of nests in the Greater Everglades, but in recent decades the majority of nesting has occurred further inland in the WCAs. In 2012 an estimated 24,191 nests (92% of all south Florida nests) were initiated either in the WCAs or ENP. This estimate is 40% lower than the decadal average and 66% lower than in 2009 when a record high of 73,096 nests was recorded. Most other regions of south Florida experienced similar declines in nest numbers during 2012. (Cook and Kobza 2012). Wading bird populations in the Everglades are dynamic, changing constantly and are influenced by many other aspects (Russell *et al*. 2002). However, the most influential aspect is perhaps human habitat alteration; particularly those that change the natural hydrological conditions. Food availability is consider the most important factor limiting populations of wading birds in the Everglades (Frederick & Spalding 1994); however hydrology is the factor that ultimately determines the availability of food. The concept of too much/too little or just the right amount of water and the too late/too early or just at the right time seem to be of particular importance for wading birds. (Cook and Kobza 2012).

Mammals that are well-adapted to the aquatic and wetland conditions of the freshwater marsh complex include the rice rat (Oryzomys palustris natator), round-tailed muskrat, and river otter (Lutra canadensis). Additional mammals that may utilize freshwater wetlands on a temporary basis include the white-tailed deer (Odocoileus virginianus), Florida panther (Puma concolor coryi), bobcat (Lynx rufus), and raccoon (Procyon lotor). Additional information on Greater Everglades fauna is also contained within the South Florida Environmental Reports which are published annually by the SFWMD:

(http://my.sfwmd.gov/portal/page/portal/xweb%20about%20us/agency%20reports#previous_reports).

3.8.1.2 Project site

The A-1 project site contains habitat for a variety of fish and wildlife species. The previous farming activities on the site may have deterred some species from utilizing the site; however, since the site has been undisturbed for several years, the amount of wildlife utilization has since increased. A list of fish and wildlife species observed on the project site is shown in **Table 3-4**. Because the list of invertebrates including insects, spiders, ants and butterflies is so large, they were not included in the list.

Table 3-4 Fish and Wildlife Observed on the A-1 Project Site

Group	Common Name	Scientific Name	A-1
Mammals	Bobcat	Lynx rufus	x
	Eastern cottontail	*Sylvilagus floridanus*	x
	Grey fox	*Urocyon cinereoargenteus*	
	Marsh rabbit	*S. palustris*	x
	Raccoon	*Procyon lotor*	
	Coyote		x
	White tailed deer	*Odocoileus virginianus*	
Birds	Anhinga	*Anhinga anhinga*	x
	Barn owl	*Tyto alba*	x
	Barn swallow	*Hirundo rustica*	x
	Belted kingfisher	*Cercyle alcyon*	x
	Black-necked stilt	*Himantopus mexicanus*	
	Boat-tailed grackle	*Quiscalus major*	x
	Burrowing owl	*Athene cunicularia floridana*	x
	Cattle egret	*Bubulcus ibis*	x
	Common grackle	*Quiscalus quiscula*	
	Common ground dove	*Columbina passerina*	
	Common moorhen	*Gallinula chloropus*	x
	Common nighthawk	*Chordeiles minor*	x
	Common yellowthroat	*Geothlypis trichas*	x
	Crested caracara	*Caracara cheriway*	
	Double-crested cormorant	*Phalacrocorax auritus*	x
	Eastern meadowlark	*Sturnella magna*	x
	Eastern towhee	*Pipilo erythropthalmus*	
	Glossy ibis	*Plegadis falcinellus*	
	Great blue heron	*Ardea herodias*	
	Great egret	*Ardea alba (Casmerodius albus)*	x
	Green heron	*Butorides virescens*	x

	Killdeer	*Charadrius vociferus*	x
	Least tern	*Sternula atillarum*	
	Limpkin	*Aramus guarauna*	
	Little blue heron	*Egretta caerulea*	x
	Loggerhead shrike	*Lanius ludovicianus*	
	Mottled duck	*Anas fulvigula*	
	Mourning dove	*Zenaida macroura*	x
	Northern bobwhite	*Colinus virginianus*	
	Northern cardinal	*Cardinalis cardinalis*	
	Northern mockingbird	*Mimus polyglottos*	
	Osprey	*Pandion haliaetus*	
	Red-shouldered hawk	*Buteo lineatus*	x
	Red-tailed hawk	*Buteo jamaicensis*	
	Red-winged blackbird	*Agelaius phoeniceus*	x
	Roseate spoonbill	*Ajaia ajaja*	x
	Snowy egret	*Egretta thula*	
	Tricolored heron	*Egretta tricolor*	x
	Turkey vulture	*Cathartes aura*	x
	White ibis	*Eudocimus albus*	x
	White-eyed vireo	*Vireo grisseus*	
	White-tailed kite	*Elanus caeruleus*	
	Wood stork	*Mycteria americana*	x
	Yellow-crowned night-heron	*Nyctanassa violacea*	
Reptiles and Amphibians	American alligator	*Alligator mississippiensis*	x
	Cottonmouth	*Agkistodon piscivorus*	
	Pig frog	*Rana grylio*	x
	Southern cricket frog	*Acris gryllus dorsalis*	
	Southern leopard frog	*Rana sphenocephala*	
	Tree frogs	*Hyla* spp.	x
	Turtle	Family *Emydidae*	
	Two-toed amphiuma	*Amphiuma means*	
Fish	Bluegill	*Lepomis macrochirus*	
	Florida gar	*Lepisosteus platyrhincus*	x
	Largemouth bass	*Micropterus salmoides*	x
	Mosquitofish	*Gambusia affinis*	x
	Redear sunfish	*Lepomis microlophus*	x

* Fish and wildlife species were observed directly or were detected by observing sign such as tracks, vocalizations, scat, exoskeletons, etc.

3.8.1.3 Stormwater Treatment Areas

The STAs are becoming known as havens for birds and wildlife. During the 109th National Christmas Bird Count conducted in January 2009, a multi-agency team documented 92,600 birds; a total of 112 species at STA 5. These species includes limpkin, roseate spoonbill, wood stork, bald eagle, Everglades snail kite, purple gallinule, black-necked stilts, sandhill crane, and some rare birds such as short-tailed hawk and Cassin's kingbird. Thus, the constructed wetland systems provide abundant breeding and foraging habitats to birds and other wildlife.

3.8.1.4 Water Conservation Areas 2A and 3A and Holey Land Wildlife Management Area

The WCAs and Holey Land as a whole contain a number of important species whose existence, population numbers, and sustainability are markedly influenced by water levels. The American alligator, a keystone Everglades species, has rebounded in terms of population numbers since the 1960s when the reptile was placed on the endangered species list by the USFWS. Alligators, it is believed, play an important ecological function by maintaining "gator holes", or depressions, in the muck which are thought to provide refuge for aquatic organisms during times of drought and concentrates food sources for wading birds. High water during periods of nest construction, which occurs from June to early July (Woodward, et al., 1989), decreases the availability of nesting sites. If conditions become too dry, either naturally or through water management practices, water levels may fall too low to maintain gator holes, forcing the animal to seek other areas to survive.

Other important reptile species commonly encountered within the WCAs and Holey Land include a number of species of turtles, lizards, and snakes. Turtle species include the snapping turtle, striped mud turtle, mud turtle, cooter, Florida chicken turtle, and Florida soft-shell turtle. Lizards such as the green anole are found in the central Everglades, and several species of skinks occur more commonly in terrestrial habitats. Numerous snakes inhabit the wetland and terrestrial environments. Drier habitats support such species as the Florida brown snake, southern ringneck snake, southern black racer, scarlet snake, and two rattlesnake species. The eastern indigo snake, a federally-listed threatened species, and the Florida pine snake, a state species of special concern, may also exist in drier areas. Wetter habitats support more aquatic species such as the water snake, the green water snake, mud snake, eastern garter snake, ribbon snake, rat snake, and the Florida cottonmouth (McDiarmid and Pritchard, 1978).

Important amphibians known to occur in South Florida include the Everglades bullfrog, Florida cricket frog, southern leopard frog, southern chorus frog, and various tree frogs common to tree islands and cypress forests. Salamanders inhabit the densely vegetated, still or slow-moving waters of the sawgrass marshes and wet prairies. They include the greater siren and the Everglades dwarf siren. Toads such as the eastern narrow-mouth toad also occur within the WCAs.

Colonial wading birds utilize the WCAs and Holey Land as both feeding and breeding habitat. The most common species utilizing the WCAs include the white ibis, great egrets, snowy egrets, cattle egrets, great blue herons, tricolored herons, little blue herons, green herons, black-crowned night herons, yellow-crowned night herons, wood storks, and glossy ibis, with populations varying widely in relationship to seasonal water level fluctuations. Historically, white ibis has been the most abundant colonial wading bird species within the WCAs with the great egret as the second (Frederick and Collopy, 1988). The WCAs and Holey Land support additional aquatic avifauna, such as the limpkin, two species of bitterns, the anhinga, as well as a number of resident and migratory waterfowl.

The Everglades fish community is composed of a variety of forage fish important in the diet of many wading birds, sport fish, native species, and exotics introduced partly through aquaculture practices and the aquarium trade. Forage species include the Florida flagfish, bluefin killifish, least killifish, shiners, mosquito fish, and sailfin molly.

The WCAs provide a valuable sport fishery for South Florida. Many of the canals, notably along US 41, I-75, and in the L-35B and L-67A, provide valuable recreational fishing for largemouth bass, sunfish, oscar, gar, bowfin, catfish and other species. Generally, Everglades sportfish are harvested from the borrow canals that surround the marsh. As water levels in the canal and marsh rise, fish populations disperse into the interior marsh and reproduce with minimum competition and predation. As water levels recede, fish concentrate into the deeper waters of the surrounding canals, where they become available as prey for wildlife and fishermen.

Several game and non-game wildlife species occur within the wetland systems in the WCAs and Holey Land including: white-tailed deer, common snipe, and marsh rabbit. Blue-winged teal, mottled ducks, and other game waterfowl are found in the sloughs. Feral hogs may also be present in drier areas or on tree islands.

3.8.2 FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

3.8.2.1 Overall Area

The federal endangered, threatened, and species of special concern list is maintained by the USFWS and the National Marine Fisheries Service (NMFS) in accordance with the Endangered

Species Act (ESA). In the ESA, “endangered” species are in danger of extinction throughout all or a significant portion of its range, “threatened” species are likely to become endangered within the foreseeable future throughout all or a significant portion of its range, and “species of special concern” might need concentrated conservation actions. A list of federally designated critical habitat for protected species is also maintained by the USFWS and NMFS in accordance with the ESA. The ESA defines “critical habitat” as 1) the specific areas within the geographical area occupied by the species at the time it is listed on which are found physical or biological features essential to the conservation of the species and which may require special management consideration or protection; and 2) specific areas outside of the geographical areas occupied by the species at the time it is listed upon a determination that such areas are essential for the conservation of the species. Listed species and designated critical habitat discussed are those that may be affected by the proposed project and the alternatives. A list of the federally protected species and critical habitat that may occur on the project site is shown in **Table 3-5**.

Table 3-5 List of Federally Protected Species and Critical Habitat may occur on the project site

Federal Listing Status **Common Name**	**Scientific Name**	**Designated Status**
Reptiles		
American alligator	*Alligator mississippiensis*	*Threatened
Eastern indigo snake	*Drymarchon coaris couperi*	Threatened
Birds		
Audubon’s crested caracara	*Caracara plancus audubonii*	Threatened
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	Endangered
Wood stork	*Mycteria Americana*	Endangered
Mammals		
Florida panther	*Puma concolor coryi*	Endangered

* Threatened due to Similarity of Appearance with the American crocodile

3.8.2.2 Project site

The project site currently supports habitat utilized by threatened or endangered species, in particular the eastern indigo snake, the Audubon’s crested caracara, the wood stork, and the Florida panther.

Eastern indigo snakes were reported in the project area from 2006 – 2011. **Figure 3-18** is based on the FWS's GIS database and shows the locations of eastern indigo snake reported from within the A-1 project site and the surrounding EAA. Currently, the former agricultural lands have converted back to wetland vegetation. Since the eastern indigo snake is typically found in upland areas, it is anticipated that eastern indigo snakes may be found in and around the levees and berms. In the sugar cane fields of the former A-I Reservoir project site, eastern indigo snakes have been observed (including one mortality) during earthmoving and other construction-related activities.

The project site is located within a USFWS Audubon crested caracara consultation area. The USFWS SLOPES defines the primary protection zone for the species as 985 feet outward from a nesting tree with a secondary zone 6,600 feet from an active nesting tree. There are no known nest sites located within 6,600 feet of the project site, as the nearest nest, documented in 2007, is over 20 miles northwest. The nearest documented occurrence was 12.6 miles southwest of the project area. (**Figure 3-19**).

The freshwater wetlands serve as foraging habitat for the wood stork. Although the nearest active wood stork colony is located over 25 miles away, wood stork are observed on the site (**Figure 3-21**).

Within the project area, there has been no panther focus area (based on telemetry point density) designated. However, within a 10 mile buffer area, 19,688 acres have been identified as a primary panther zone and 101,350 acres have been identified as secondary panther zone (USFWS GIS database, 2012). Therefore, it is anticipated that panthers may hunt on the project site, but it is unlikely that they would use these areas for any extended length of time because of the lack of suitable long-term panther habitat (URS 2007). In addition, the site borders the eastern extent of the panther's secondary zone (**Figure 3-22**). No Florida panthers have been sighted on the property; however, they have been documented in the area (**Figure 3-23**).

3.8.2.3 Stormwater Treatment Areas 2 and 3/4

The eastern extent of STA 2 is within the core foraging area of four wood stork colonies, and the wood storks have been documented to utilize the wetlands within the both STAs. The southeast corner of STA 3/4 also falls within the 18.6 mile buffer area of a wood stork colony.

The levees and berms may provide habitat for the eastern indigo snake. Alligators are present within both STAs. Although it was originally anticipated that the Everglades snail kites would only forage in the STAs, there have been documented reports that the snail kites nested within STA 3/4 in 2011 and have begun nesting in STA 1E (USFWS GIS database, 2012).

3.8.2.4 Water Conservation Areas and Holey Land Wildlife Management Area

Federally protected species occurring in the WCAs include many of the protected species in the South Florida region including the American alligator, wood stork, Audubon's crested caracara, Everglades snail kite, Florida panther, and possibly the Eastern indigo snake. The WCAs also have designated critical habitat for the Everglades snail kite in WCA 2 and WCA 3, and support several successful nests.

3.8.2.5 Species Descriptions

3.8.2.5.1 American Alligator

The American alligator (*Alligator mississippiensis)* is a large, carnivorous reptile related to crocodiles that inhabits freshwater lakes, ponds, marshes, sloughs, swamps, canals and, occasionally, brackish waters throughout the southeastern United States. It is commonly seen on canal banks throughout the EAA and in the WCAs.

In 1985, alligators were down-listed in Florida from "threatened" to status of "threatened due to similarity of appearance" because of its similarity to the endangered American crocodile (*Crocodylus acutus*). A distinguishing characteristic from the American crocodile, a close relative, is that only the upper teeth are visible with the alligator's mouth closed, while both the upper and lower teeth are visible on the American crocodile. The listing "threatened due to similarity of appearance" is defined for species that are not currently biologically threatened but that are believed likely to become endangered in the future (50 CFR Part 17). Therefore, no coordination is needed for this species.

3.8.2.5.2 Eastern Indigo Snake

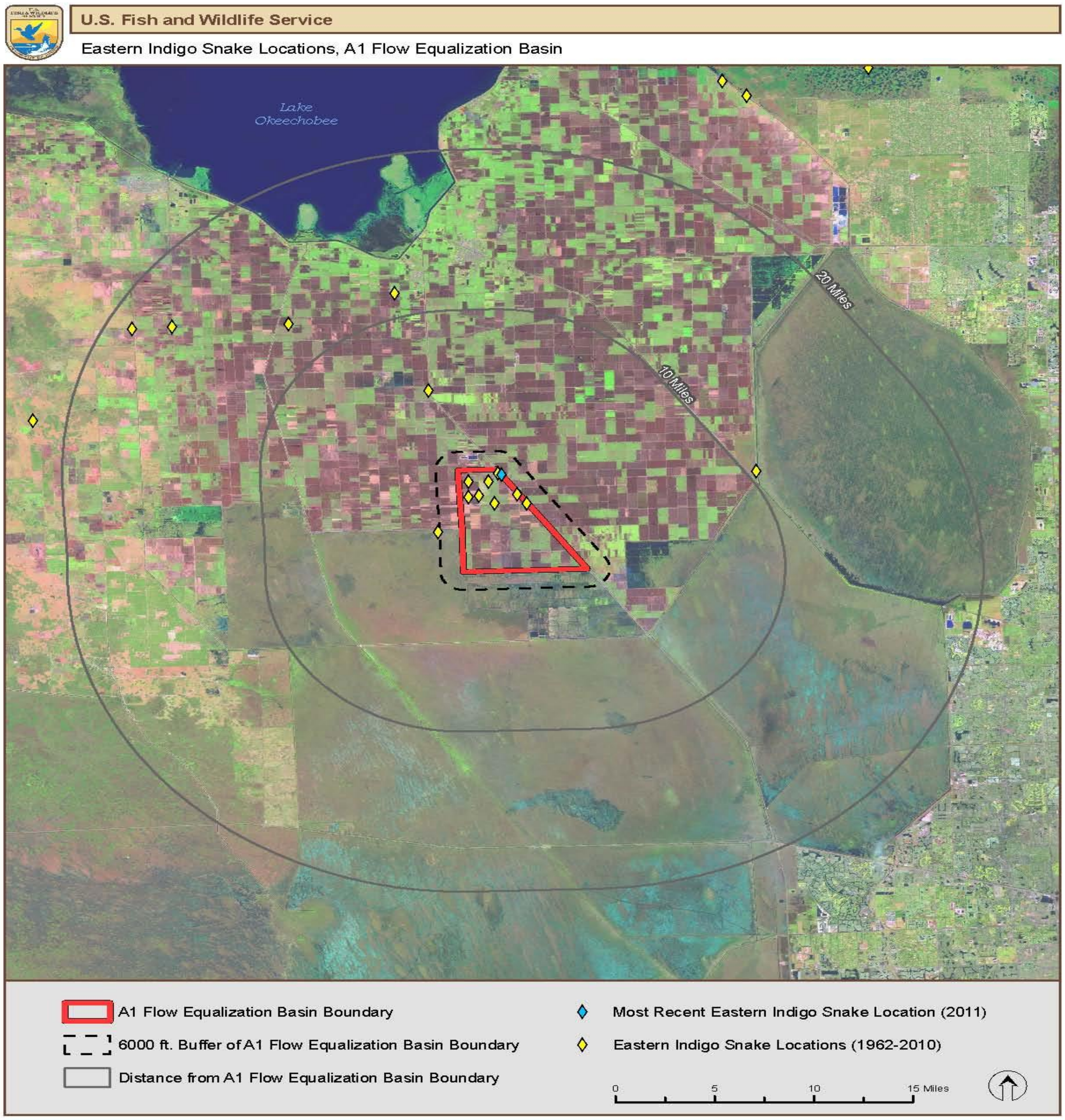
The eastern indigo snake (*Drymarchon corais couperi*) is federally listed as threatened. It is a large, black, non-venomous snake that reaches lengths up to of 265 cm (Ashton and Ashton 1981). Its historical range extended throughout Florida and the coastal plains of Mississippi, Alabama, and Georgia (USFWS 1999).

The eastern indigo snakes preferred habitats are uplands (flatwoods, dry prairies, tropical hardwood hammocks, and coastal dunes). They are not usually found in Everglades wetlands (Steiner and others 1983), but can be found on the edges of freshwater marshes and in agricultural fields (USFWS 1999). They are extremely susceptible to desiccation and cold. In dry, cold habitats (Georgia, Alabama, and the Florida panhandle), eastern indigo snakes depend on the holes of the gopher tortoise (*Gopherus polyphemus*), which provide protection from cold and dry conditions (Layne and Steiner 1996). Throughout the warmer environment of peninsular Florida, eastern indigo snakes may exist in any terrestrial habitats with low urban development (USFWS 1999). They frequently use natural holes, gopher tortoise burrows, trash piles and the like even in warmer south Florida. They use a variety of food sources including fish, frogs, toads, lizards, turtles and their eggs, small alligators, birds and small mammals (USFWS, 1999).

Initially, the population decline of eastern indigo snakes was from over-collecting for the pet trade (43 FR 4028), but current major threats to the eastern indigo snake include loss and fragmentation of habitat from increased development (USFWS 1999). Other threats to the eastern indigo snake associated with development include increased mortality from vehicular collisions, domestic pets, and people, and pesticides (USFWS 1999).

Eastern indigo snakes range over large areas and use various habitats throughout the year, with most activity occurring in the summer and fall (Smith 1987; Moler 1985a). Adult males have larger home ranges than adult females and juveniles; their ranges average 554 acres (Moler 1985b). In contrast, a gravid female may use from 3.5 to 106 acres (Smith 1987). In Florida, home ranges for females and males range from 5 to 371 acres and 4 to 805 acres, respectively (Smith 2003). At the Archbold Biological Station (ABS), average home range size for females was determined to be 47 acre and overlapping male home ranges to be 185 acre (Layne and Steiner 1996).

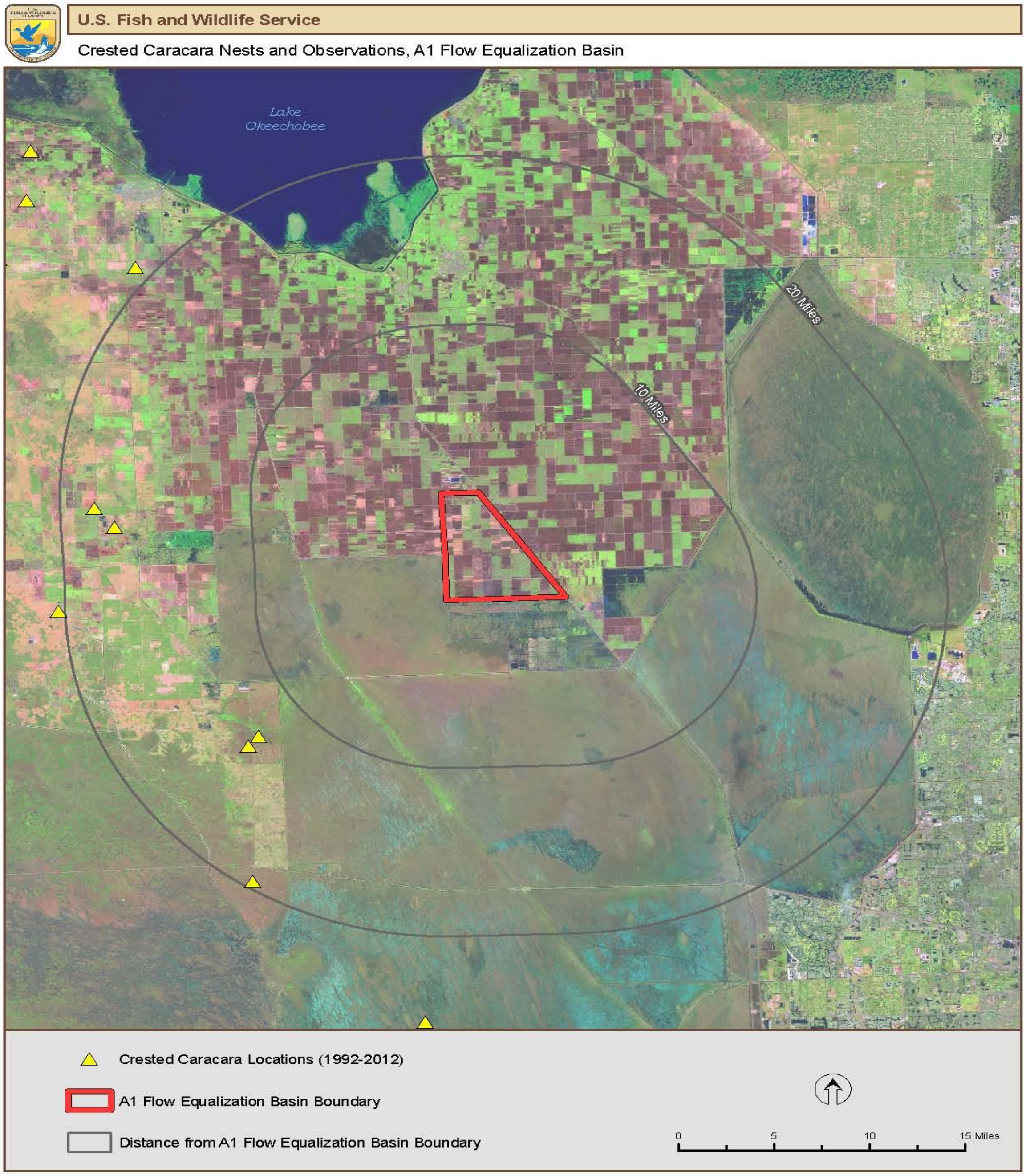
Figure 3-18 Eastern Indigo Snake Sightings



3.8.2.5.3 Audubon's Crested Caracara

The Audubon's crested caracara (*Polyborus plancus audubonii*) is federally listed as threatened. It is a large non-migratory raptor with its overall distribution including the southern United States, Mexico, and Central America to Panama. In Florida, the most abundant populations of crested caracara are in Glades, Desoto, Highlands, Okeechobee, and Osceola counties, all of which are located north and west of Lake Okeechobee (USFWS 1999). Caracaras are most commonly found in dry or wet prairies with occasional cabbage palms (*Sabal palmetto*) or scattered wooded vegetation. Prey include insects and other small invertebrates, small mammals, reptiles, and fish. Because of changes in land use, the crested caracara also now uses improved or semi-improved pastures (USFWS 1999). The primary threat to the crested caracara is in the conversion from dried prairies to agriculture and development. The project site is located within a USFWS crested caracara consultation area. See **Figure 3-19** for the nearest documented occurrence of the Audubon's crested caracara in relation to the project site.

Figure 3-19 Audubon's Crested Caracara Locations



3.8.2.5.4 Everglade Snail Kite

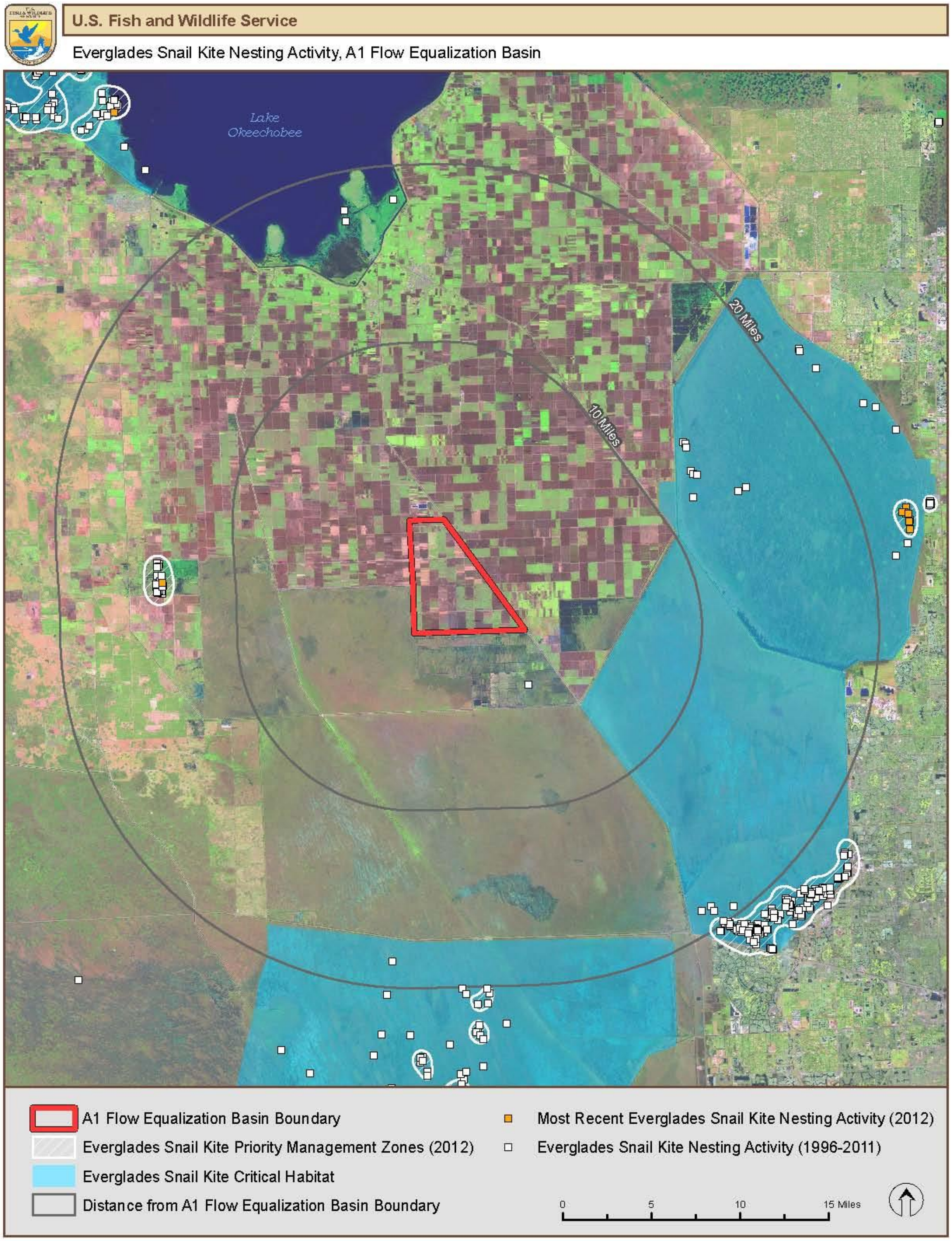
The endangered Everglade snail kite (*Rostrhamus sociabilis plumbeus*) is a medium sized raptor that feeds almost entirely on apple snails (*Pomacea paludosa*) which are found in palustrine emergent, long hydroperiod wetlands (USFWS, 1999). The snail kite's foraging habitat is restricted to clear, calm waters of freshwater marshes and shallow vegetated littoral zones of lakes in South and Central Florida including Palm Beach and Hendry Counties. Snail kites require small trees or shrubs near foraging areas as nest sites and shallow inundated areas to sustain their food source, apple snail.

Apple snails inhabit a wide range of ecosystems from swamps, ditches and ponds to lakes and rivers. Apple snails eat, feed, breed, and lay eggs on emergent vegetation in waterbodies that are flooded continuously for longer than 1 year (USFWS 1999). Changes in water regimes and depth and duration of inundation are important characteristics for wetland vegetation that supports snail kite nesting and foraging habitat, Florida apple snails, and all aspects of snail kite and apple snail life history. Rapid and/or large increases in water depth may detrimentally affect desirable vegetation, and can flood out Florida apple snail eggs, leading to reductions in apple snail populations and reduced snail kite foraging (USFWS 2006).

Designated critical habitat for the snail kite exists on the western side of Lake Okeechobee and portions of the EPA, including WCA 1, WCA 2 and WCA 3A. Snail kites are also found in Holey Land. Wood storks and snail kites have overlapping ranges, but different feeding mechanisms and require different hydrologic conditions for optimum feeding. Historically, both have survived with the hydrologic variability characteristic of the natural system. The reduced heterogeneity and extent of natural area of the present system make the snail kites more vulnerable to natural and human-caused threats (USFWS, 1999).

Loss and degradation of habitat are the primary threat to snail kites. Water levels, duration, and quality are primary concerns in Everglade snail kite conservation. Water levels must allow for appropriate nesting sites, durations of water levels must be sufficient to support apple snail populations, and water quality must be such that invasive species do not take over Everglade snail kite foraging habitat (USFWS 1999). The project site, the STAs and WCAs are all within Everglade snail kite USFWS consultation area. The nearest nest to the project area, recorded in 2011, was located approximately 3 miles from the A-1 project site (**Figure 3-20**). The most recent nests, recorded in 2012, were located 14.1 miles to the west and 22.3 miles to the east (WCA 1).

Figure 3-20 Everglades Snail Kite Nesting Activity

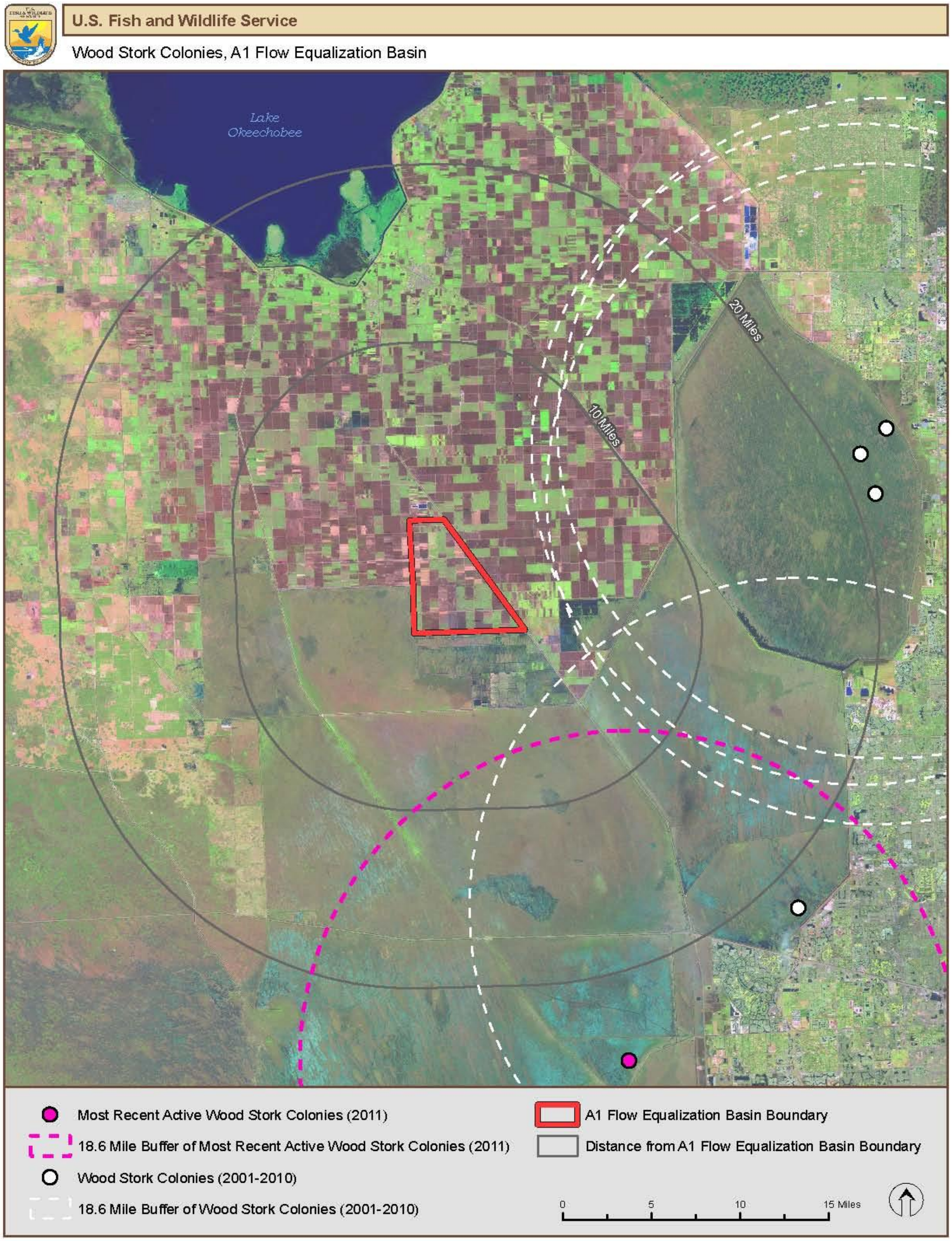


3.8.2.5.5 Wood Stork

The endangered wood storks (*Mycteria Americana*) are tall, long-legged wading birds that utilize a variety of freshwater and estuarine wetlands (USFWS 1999) including shallow freshwater wetlands, canals, and ditches to catch prey. Historically, breeding colonies existed in coastal states from Texas to South Carolina, but today breeding colonies are limited to Georgia, Florida, and coastal South Carolina (USFWS 1999). Their non-breeding season range extends throughout the continental United States.

The timing, duration, and quantity of water affect wood stork distribution for two reasons: shallow waters with high prey densities are needed for feeding; and they prefer nesting sites surrounded by deep water. The primary prey of wood storks is small fish. During feeding, wood storks immerse their bill, partly open, in water and snap it shut when it contacts a prey item (Kahl 1964, as cited in USFWS 1999). This feeding behavior, known as tactolocation or grope feeding, requires high prey concentrations found after drying events that concentrate fish to smaller areas. Nesting colonies of wood storks are usually established in stands of medium to tall trees, such as cypress stands or mangrove forests, surrounded by deeper water marshes (Palmer 1962; Rogers and others 1996; and Ogden 1991, as cited in USFWS 1999). These areas provide protection from terrestrial predators. Core foraging areas include an 18.6-mile radius around breeding colonies (USFWS SLOPES). The nearest active colony reported in 2009 is located 21.2 miles from the A-1 project site (**Figure 3-21**). Documented in 2011, the most recent active colony is 25.0 miles south of A-1 project site (USFWS GIS database, 2012).

Figure 3-21 Wood Stork Colonies



3.8.2.5.6 Florida Panther

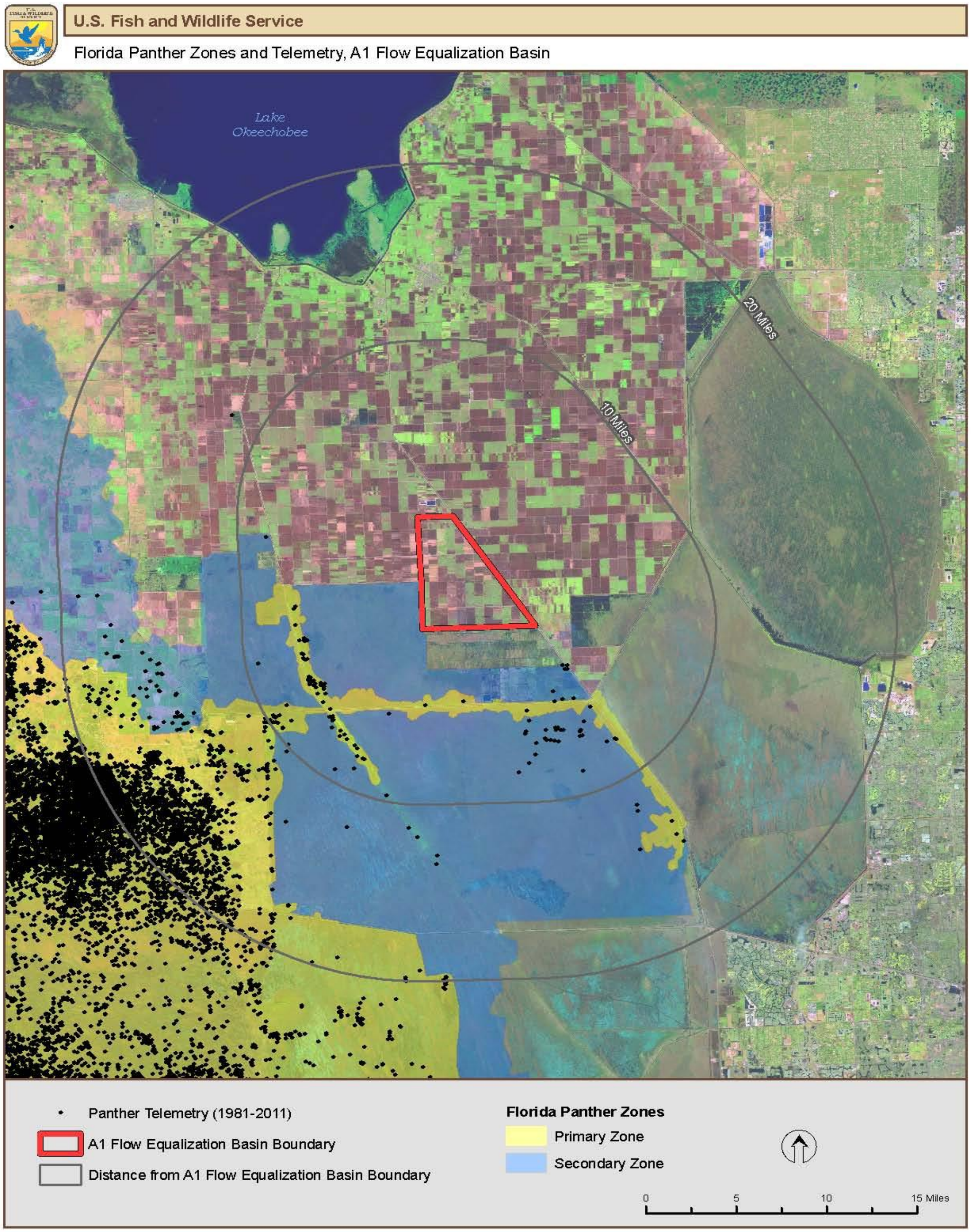
The Florida panther (*Puma concolor coryi*), a medium-sized tawny-colored long-tailed puma, is one of the most federally listed endangered land mammal. At one time, the panther's range extended through Arkansas, Louisiana, Mississippi, Alabama, Georgia, Southern Tennessee, South Carolina, and Florida. Today, the only existing population is found in a two million acre area in central and South Florida with population estimates of only 80 total individuals, 30 to 50 adults and approximately 30 subadults (USFWS 1999). The Big Cypress Swamps/Everglades has the only known breeding panther population (USFWS 1999).

The Florida panther, a subspecies of the mountain lion, is Florida's designated state mammal. Male panthers weigh 102 to 154 pounds and reach 7 feet in length, while the smaller females weigh 50 to 108 pounds and reach 6 feet in length (Roelke 1990). Panther's preferred habitats are hardwood hammocks and pine flatwoods, but they can also be found in wetlands and disturbed habitat (USFWS 1999). The panther diet includes feral hogs (*Sus scrofa*), white-tailed deer *(Odocoileus virginianus)*, raccoon (*Procyon lotor*), and armadillo (*Dasypus novemcinctus*) (Maehr *et. al.* 1990).

Habitat loss and fragmentation from development are the largest threat to panthers and have lead to inbreeding, reduced prey availability, and mortality from vehicle strikes. An individual panther range may extend on average 200 square miles for males and 74 square miles for females (Land 1994). The panther's wide-range recovery plan cites three conditions necessary for the survival and recovery of the species: (1) protection and enhancement of existing populations, habitats, and prey resources; (2) improving genetic health and population viability; and (3) re-establishing a minimum of two more reproducing populations within the historical range.

Panther telemetry data from 1981 to 2005 show panthers in the EAA, including areas directly adjacent to the project site and in WCA 3A (USFWS 2006). Based on the USFWS' GIS Database, **Figure 3-22** depicts the panther telemetry data from 1997 through 2011.

Figure 3-22 Panther Telemetry



3.8.3 STATE LISTED SPECIES

3.8.3.1 Project Site

The project site and the affected areas contain habitat for several state listed species. The scraped wetlands on the project site contain habitat for several State-listed birds, such as the Florida sandhill crane, limpkin, snowy egret, little blue heron, tricolored heron, white ibis, and roseate spoonbill. SFWMD staff has conducted wildlife surveys on the project site in December 2012 and February 2013. Multiple species of wading birds, including tricolored herons, little blue herons, great egrets, white ibises, snowy egrets, wood storks, and roseate spoonbills have been observed foraging at the site while limpkins have been heard calling. Black-necked stilt, Everglade's snail kite, Audubon's crested caracara, eastern indigo snake, Florida panther, burrowing owl, or least tern were not observed within the A-1 project site during the surveys. However, least terns have been observed nesting within the project site during previous years. In addition, the Florida burrowing owl and the least tern are known to nest near the project site.

3.8.3.2 Overall Area

State listed endangered animal species include the whooping crane (*Grus Americana*) while the listed threatened animal species include the Florida sandhill crane (*Grus Canadensis pratensis*) and the least tern (*Sternula antillarum*). The species of special concern include the Florida mouse (*Podomys floridanus*), black skimmer (*Rynchopsniger*), limpkin (*Aramus guarauna*), reddish egret (*Egretta rufescens*), snowy egret (*Egretta thula*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), white ibis (*Eudocimus albus*), roseate spoonbill (*Ajaia ajaia*), the burrowing owl (*Athene cunicularia*), gopher tortoise (*Gopherus polyphemus*), and the gopher frog (*Rana capito*). Information for each species was obtained directly from the Florida Fish and Wildlife Conservation Commission's website at:

http://myfwc.com/wildlifehabitats/imperiled/profiles.

3.8.3.3 Endangered Species

3.8.3.3.1 Whooping Crane

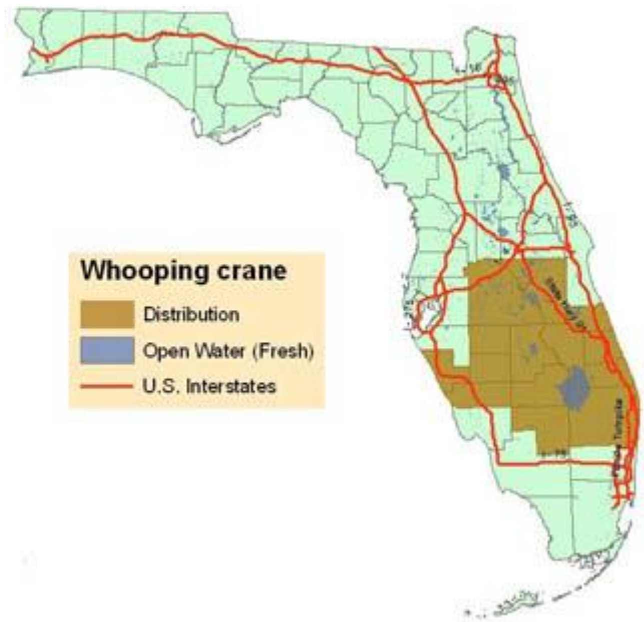
The whooping crane is the tallest bird in North America, standing nearly five feet tall with a wing span of seven to eight feet. Adult whooping cranes are solid white with a red crown on their head, long black legs, and a long "S" shaped neck. Whooping crane chicks have a cinnamon brown body color; however, by the age of four months they will begin to gain adult-like white feathers. The diet of whooping cranes primarily consists of aquatic invertebrates (insects, crustaceans, and mollusks), small vertebrates (fish, reptiles, amphibians, birds, and mammals), roots, acorns, and berries.

While courting, males will perform a dancing ritual that includes them jumping, flapping their wings, and tossing objects into the air (The Cornell Lab of Ornithology 2011). The nesting season in Wood Buffalo National Park (located in Alberta and the Northwest Territories of Canada) occurs between the months of April and May, while cranes in Florida breed between the months of January and May. The clutch size for the whooping crane ranges from one to three eggs (M. Folk pers comm. 2011). Eggs are incubated for 29-31 days with both parents sharing the incubating duties. Breeding pairs will re-nest if the first clutch of eggs is destroyed before mid-incubation. It is rare for more than one of the chicks from a single nest to survive. Whooping crane chicks are able to fly (fledge) at 80 to 90 days old. Juvenile migratory cranes become independent from their parents on their first migration north, while non-migratory whooping cranes become independent before their parents' next breeding season. Whooping cranes mate for life, but will pick new partners if the previous partner is lost. Females produce their first fertile eggs at four to seven years of age.

Habitat and Distribution

Whooping cranes have a very limited range and only inhabit shallow marshes and open grasslands (**Figure 3-23**). The only natural whooping crane nesting population is located in Wood Buffalo National Park. This population winters in and around Aransas National Wildlife Refuge, which is located on the Texas Gulf Coast. There is a non-migratory population in Central Florida that the Fish and Wildlife Conservation Commission introduced in 1993. The introduction was stopped in 2008 due to survival and reproduction problems. During the winter, migratory whooping cranes are led by an ultra-light aircraft from Wisconsin to Florida. A new project to reintroduce non-migratory whooping cranes to Louisiana was begun in early 2011 (Louisiana Department of Wildlife and Fisheries 2011).

Figure 3-23 Whooping Crane Distribution



Threats

The main threat to the whooping crane is the alteration and degradation of their habitat in the Aransas National Wildlife Refuge. Pollution is also a threat to the whooping crane in Aransas, as the boats and barges in the Intracoastal Waterway carry toxic chemicals that could cause devastating effects to the species if spilled. Their extremely small range also puts them at risk to suffer a population decline during natural disaster events. Other threats include illegal hunting, collisions with cars, and increased predation by other species such as the black bear, wolverine, gray wolf, red fox, lynx, and bald eagle (Lewis 1995). Also, in recent times, wind farms and their associated power lines in the migratory corridor have become a major concern (Canadian Wildlife Service and U.S. Fish & Wildlife Service 2007).

http://myfwc.com/wildlifehabitats/imperiled/profiles/birds/whooping-crane/

3.8.3.4 Threatened Species

3.8.3.4.1 Florida Sandhill Crane

The Florida sandhill crane can reach a height of 47.2 inches (120 centimeters) with a wingspan around 78.7 inches (200 centimeters) (Nesbitt 1996). This species is gray with a long neck and legs, and a bald spot of red skin on the top of its head. The sandhill crane is unique in flight as it can be seen flying with its neck stretched out completely.

Life History

The diet of the Florida sandhill crane primarily consists of grain, berries, seeds, insects, worms, mice, small birds, snakes, lizards, and frogs. Florida sandhill cranes are a non-migratory species that nests in freshwater ponds and marshes. This species is monogamous (breeds with one mate). Courtship consists of dancing, which features jumping, running, and wing flapping (International Crane Foundation, n.d.). Sandhill crane nests are built by both mates with grass, moss, and sticks. Females lay two eggs that incubate for 32 days. Both male and female participate in incubating the eggs (Nesbitt 1996). The offspring will begin traveling from the nest with their parents just 24-hours after hatching. At ten months old, juveniles are able to leave their parents (Nesbitt 1996). Bonding between pairs begins at two years old.

Habitat and Distribution

Florida sandhill cranes inhabit freshwater marshes, prairies, and pastures (Florida Natural Areas Inventory 2001). They occur throughout peninsular Florida north to the Okefenokee Swamp in southern Georgia; however, they are less common at the northernmost and southernmost portions of this range (**Figure 3-24**). Florida's Kissimmee and Desoto prairie regions are home to the state's most abundant populations (Meine and Archibald 1996).

Figure 3-24 Florida Sandhill Crane Distribution

Threats

Degradation or direct loss of habitat due to wetland drainage or conversion of prairie for development or agricultural use is the primary threats facing Florida sandhill cranes. The range of the Florida sandhill crane diminished in the southeastern United States during the 20th century, with breeding populations disappearing from coastal Texas, Alabama, and southern Louisiana due to degradation, habitat loss, and overhunting. (Meine and Archibald 1996).

http://myfwc.com/wildlifehabitats/imperiled/profiles/birds/florida-sandhill-crane/

3.8.3.4.2 Least tern

The least tern is the smallest tern in North America. Least terns can reach a length between 8.3-9.1 inches (21-23 centimeters) with a wingspan of 21-23 inches (53-58 centimeters) (Thompson et al., 1997). Least terns have long pointed wings and a deeply forked tail. Other physical characteristics include a yellow beak, gray back, white belly, and black cap.

Life History

The least tern’s diet primarily consists of fish, but they will also feed on small invertebrates. (The Cornell Lab of Ornithology, 2011). Male least terns have a unique courtship ritual. During courting, the male will offer the female food in hopes of gaining her choice as a mate. Once the two mates are together they will begin building the nest in shallow depressions in bare beach sand. Least terns will also build nests on gravel rooftops. Least terns lay eggs between the middle of April and the beginning of May. The eggs are camouflaged to help prevent predation. Egg incubation lasts for 21 days. Young least terns are able to leave the nest three to four days after hatching.

Habitat and Distribution

The least tern inhabits areas along the coasts of Florida including estuaries and bays, as well as areas around rivers in the Great Plains (Florida Natural Areas Inventory 2001). In Florida, the least tern can be found throughout most coastal areas (**Figure 3-25**). Outside of Florida, least terns are found along the U.S. Atlantic Coast, mid Atlantic states, and down from Mexico to northern Argentina (Florida Natural Areas Inventory 2001)

Figure 3-25 Least Tern Distribution

.

Threats

The least tern faces many threats as the human population increases along the coasts. The main threat to the least tern population is habitat loss. Loss of habitat is often attributed to coastal development. Coastal development causes damage to least tern habitat because of the building on the coasts, human traffic on the beaches, and recreational activities. Increased numbers of predators due to the larger amounts of available food and trash for scavenging are also a threat to the least tern. Predators can cause destruction to breeding colonies while they are nesting by destroying nests and eating chicks and eggs. Also, global climate change is an impending threat to the least tern. Rising sea levels and more frequent strong storms may damage and destroy least tern nests, as well as habitat. Spring tides can also cause flooding of least tern nests. Other threats to the least tern include shoreline hardening, mechanical raking, oil spills, response to oil spill events, and increased presence of domestic animals (Defeo et al. 2009).

http://myfwc.com/wildlifehabitats/imperiled/profiles/birds/least-tern/

3.8.3.5 Species of Special Concern

3.8.3.5.1 Florida mouse

The Florida mouse is a large member of the genus *Podomys* that can reach a length of eight inches (20.3 centimeters) and a weight of 0.7 to 1.7 ounces (36.9-49 grams). This species has a yellowish-brown upper body with orange colored sides and a white belly. It also has five plantar tubercles (foot pads) on each foot, which is distinct to the species (Florida Natural Areas Inventory 2001, Layne 1990, Layne 1992, Jones and Layne 1993).

Life History

The diet of the Florida mouse primarily consists of seeds, plants, fungi, and insects (Smithsonian National Museum of Natural History, n.d.).The Florida mouse digs small burrows inside the burrows of other species, primarily the gopher tortoise, where they will prepare a nest (Smithsonian National Museum of Natural History, n.d.). Reproduction occurs throughout the year, but peaks in the fall and winter. The number of young per litter is typically between two and four. Offspring are weaned at three to four weeks of age (Jones 1990, Layne 1990, Jones and Lane 1993).

Habitat and Distribution

The Florida mouse inhabits xeric uplands (ecological communities with well drained soils) such as sandhill and scrub (Florida Natural Areas Inventory 2001). Peripheral peninsular counties are St. Johns, Clay, Putnam, Alachua, Suwannee, and Taylor counties in the north, south to Sarasota County on the west coast (although not documented in Sarasota County in recent years), south to Highlands County in central Florida, and, at least formerly, south to Dade County on the east coast now south to near Boynton Beach (**Figure 3-26**) (Layne 1992; Jones and Layne 1993; Pergams et al. 2008).

Figure 3-26 Florida Mouse Distribution

Threats

The Florida mouse exhibits narrow preferences for fire-maintained, xeric upland habitats occurring on deep, well-drained soils, especially scrub and sandhill habitats (Jones and Layne 1993). Because of this narrow habitat specificity, the major threat to the Florida mouse is loss and degradation of habitat caused by conversion to other uses (e.g. development and agricultural use) and insufficient management (e.g., fire suppression) (Layne 1990, 1992). In Highlands County, 64% of the species' habitat was destroyed between 1940 and 1980, with an additional 10% considered disturbed or degraded (Layne 1992).

http://myfwc.com/wildlifehabitats/imperiled/profiles/mammals/florida-mouse/

3.8.3.5.2 Black skimmer

The black skimmer is a seabird with defining physical characteristics that make it easily distinguishable from others. The key physical feature of the skimmer is its large red and black bill. The bill begins to widen at the top and gradually becomes smaller as it forms a sharp tip at the end of the bill. The lower part of the bill is longer than the top, which is important because they use their bill to skim along the top of the water to catch fish, for which they are aptly named. Skimmers can reach a height of 19.7 inches (50 centimeters) with a wingspan of 3 to

3.5 feet (.9-1.1 meters) (The Cornell Lab of Ornithology 2011, E. Sachs pers. comm. 2011). Skimmers have a black back, black wings with white edging, and a white belly and head.

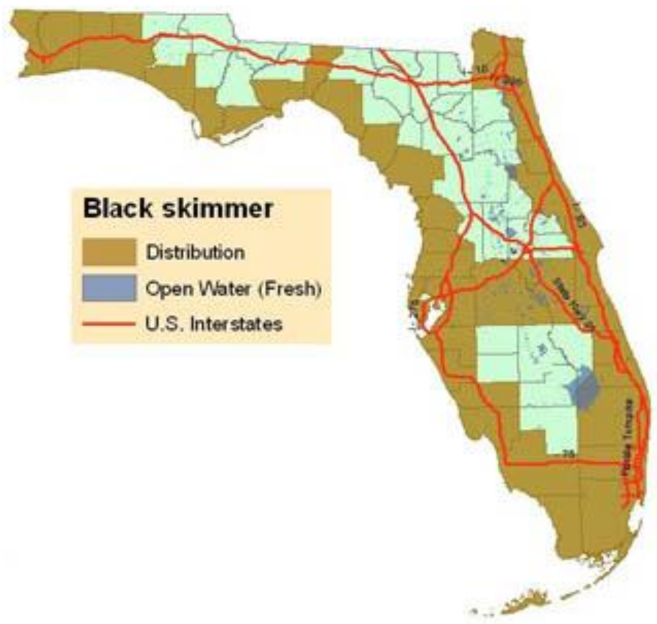
Life History

The diet of the black skimmer primarily consists of fish. The skimmer has a unique style of feeding that involves literally “skimming” the surface of the water with their lower bill. When they contact a prey item, they quickly bend their head forward and snap the upper bill closed, seizing their prey. Breeding occurs during the summer, generally between May and early September (Katja Schulz, n.d.). Skimmers nest on the sand along beaches, sandbars, and islands developed by dredged-up material. Nesting occurs in colonies consisting of one to several hundred pairs of skimmers. Skimmers are protective of their nests and offspring and will utilize group mobbing to protect the nests. Skimmers usually lay three to five eggs per nest and eggs are incubated by both parents for approximately 23-25 days (The Cornell Lab of Ornithology 2011). Each parent incubates the eggs for up to four hours at a time (Gochfield and Burger, 1994). Once hatched, parents guard the offspring until they are able to fly at about 28-30 days old (Katja Schulz, n.d.).

Habitat and Distribution

The black skimmer inhabits coastal areas in Florida such as estuaries, beaches, and sandbars (**Figure 3-27**). Skimmers can be found from the coasts of the northeastern U.S., down to Mexico, and over to the Gulf Coast of Florida. Breeding range is from Southern California, down to Ecuador.

Figure 3-27 Black Skimmer Distribution



Threats:

The black skimmer faces many threats as the human population increases and spreads to previously undeveloped coasts. Habitat loss due to coastal development is the main threat to the species. People are relocating to the coasts at unprecedented levels causing increased development and traffic on the beaches, as well as increased predators; all of which are detrimental to skimmer habitat. Predators will feed on skimmer eggs and chicks and include species such as raccoons, crows, opossums, feral hogs, and coyotes. Because skimmers nest on the beach and are colonial they are extremely vulnerable to disturbance by people, pets, and predators. Other threats include recreational activity, beach driving, shoreline hardening, mechanical raking, oil spills, and increased presence of domestic animals, all of which may prevent or disrupt nesting or result in the death or abandonment of eggs and young. Global climate change is an impending threat to the black skimmer. Sea level rise may cause destruction to primary nesting areas, resulting in a decreased population size.

http://myfwc.com/wildlifehabitats/imperiled/profiles/birds/black-skimmer/

3.8.3.5.3 Limpkin

The limpkin is a long-legged species of waterbird that has dark brown feathers with streaks of white on the head and neck and absent on the rest of the body. Limpkins can grow up to 28 inches (71.1 centimeters) long, with a 42 inch (106.7 centimeters) wingspan, and weigh up to 46 ounces (1,304 grams) (The Cornell Lab of Ornithology 2011). White blotches and triangular marks can be found on the neck and upper body. The key physical feature of the limpkin is their down-curved bill, which is used to feed on their primary prey, apple snails. Limpkins are also known for their resounding calls, which are characterized as a high pitched “Kree-ow, Kra-ow” sound.

Life History

Limpkins feed primarily on apple snails, but they will also eat insects, worms, and mussels. Limpkins will walk in shallow waters searching for apple snails and utilize their down-curved bills to get the snail out of its shell. The limpkin nests in a variety of areas including vegetation in marshes and freshwater, and in bushes or tree limbs that are up to 40 feet high (12.2 meters) (The Cornell Lab of Ornithology 2011). The limpkin courtship ritual includes the male feeding the female, imitating an adult feeding a juvenile. Nesting occurs between the months of February and June. The female will lay between four to eight eggs in one nesting season and incubate the eggs for approximately 27 days (The Cornell Lab of Ornithology 2011).

Habitat and Distribution

The limpkin inhabits shallows along rivers, streams, lakes, and in marshes, swamps and sloughs in Florida (**Figure 3-28**). In the U.S., the Limpkin is found only in the Florida. Limpkins are fairly widespread in peninsular Florida, but rarer in the Panhandle and Keys. Outside of the U.S., they are found in the Caribbean, Central America, and most of South America east of the Andes Mountains.

Figure 3-28 Limpkin Distribution

Threats

Historically, the limpkin was almost extirpated from Florida due to overhunting. New laws and conservation efforts prevented this from happening and the population recovered. There are still major threats to the limpkin population that include the decline of their primary prey, apple snails. Due to habitat destruction and wetland drainage, heavy accumulations of non-native vegetation (mainly hyacinths and cattails) in foraging areas prevents the limpkin from being able to locate food. Other threats include pollution and an overabundance of nutrition in wetlands (Crozier and Gawlik, 2002; Bryan 2002).

http://myfwc.com/wildlifehabitats/imperiled/profiles/birds/limpkin/

3.8.3.5.4 White Ibis

The white ibis is easily identified by its long red legs, all white plumage, red face, long decurved red bill and black tipped wings. White ibises are medium-sized wading birds, weighing about two pounds, with a 36-inch wingspan, and a length of 24 inches. White ibises inhabit shallow coastal marshes, wetlands and mangrove swamps and feed on crayfish, crabs, insects, snakes, frogs and fish (Kushlan and Bildstein 1992). Nesting occurs in trees, shrubs, and grass clumps from ground level to a height of 50 feet. Nests are constructed of vegetation sticks, leaves and/or roots. Females typically lay two to three eggs; eggs are incubated for 21 to 22 days. The young are able to leave the nest at 9 to 16 days of age. Nestlings are independent at 40 to 50 days of age. Breeding season extends from March to August (FWC 2003c). Ibises are known for frequent shifts in roost and colony sites.

The white ibis has been recorded breeding throughout the state of Florida; the center of breeding abundance occurs in the Everglades, with breeding populations extending into Florida Bay and the Keys (FWC 2003c). Aerial surveys have revealed 90 percent declines in south Florida breeding pairs since the 1940s and 20 to 50 percent declines statewide during the past decade. Because of this, the FWC listed the white ibis as a state listed species of special concern (FWC 2003c). Population declines of the species are attributed to loss and degradation of suitable habitat; however, large populations of white ibises remain.

The white ibis is a midsized member of the Family Threskiornithidae. This species is approximately 22 inches (56 centimeters) long with a wingspan of approximately 37 inches (96 centimeters) (Frederick 1996). Adults are mostly white with black tipped wings, a red face, red legs, and a very distinct downcurved, pink bill which is used to probe the ground for food while foraging.

Life History

The diet of the white ibis primarily consists of crabs, crayfish, fish, snakes, frogs, and insects. Ibis breed in large colonial groups along the coast and inland between February and October, with the peak in the spring and summer. Nests are made of sticks, leaves, and roots, and can be found both on the ground and as high as 50 feet (15.2 meters) up in trees. Females lay between two and four eggs in one nesting and incubation can last up to 22 days with both parents sharing incubation responsibility. Between the ages of 9 and 16 days, the young become more mobile; however, the young generally remain in the nest until they are 28 to 35 days old.

Habitat and Distribution

White ibis prefer coastal marshes and wetlands, feeding in fresh, brackish, and saltwater environments. They range from Baja California and Sinaloa, Mexico, east through south Texas, Louisiana, Alabama, Georgia, coastal North Carolina, south throughout the Greater Antilles, and South America to Peru, and French Guiana. This species is found throughout most of Florida (Figure 3-29).

Figure 3-29 White Ibis Distribution

Threats

The main threat to the white ibis is the loss of wetland habitat due to the human development of coastal areas and their freshwater feeding areas. The alteration of wetlands, pollution, and saltwater influxes are other habitat threats as these practices degrade the quality of wetlands and decrease the availability of prey (Florida Natural Areas Inventory 2001, Bildstein et al. 1990, Frederick 1987, Adams and Frederick 2009, Herring et al. 2010).

http://myfwc.com/wildlifehabitats/imperiled/profiles/birds/white-ibis/

3.8.3.5.5 Snowy Egret, Reddish Egret, Little Blue Heron and Tricolored Heron

The snowy egret, reddish egret, little blue heron and tricolored heron are listed by the FWC as a species of special concern. Snowy egrets are medium sized herons, with entirely white plumage, long slender black bills, long black legs and bright yellow feet (Parsons and Masters 2000). The snowy egret breeds in Florida from January through August, breeding mostly in central and southern Florida in freshwater and saltwater marshes (FWC 2003c). The tricolored heron occupies similar habitats; breeding occurs in February through August (FWC 2003c). The tricolored heron is ornately colored; it is slate-blue on its head and upper body and has a purplish chest with white under parts and fore-neck (Frederick 1997). The little blue heron is a smaller-sized heron, dark overall with yellow-green legs, and a blue bill with a black tip (Rodgers and Smith 1995). The little blue heron shows a preference for freshwater habitat; however, it also inhabits saltwater marshes. Little blue herons breed later than tricolored herons or snowy egrets; breeding occurs in April through September in Florida. The little blue heron is more widely distributed throughout the state in comparison to the tricolored herons or snowy egrets. Like the snowy egret, breeding populations are concentrated in central and southern Florida (FWC 2003c).

Reddish egrets have two color morphs; white and dark. Dark morphs have gray bodies with chestnut heads, blue legs and pink bills with black tips (Lowther and Paul 2002). The reddish egret is the rarest heron in Florida and is entirely restricted to the Florida coast with concentrations in Florida Bay and the Keys; two-thirds of the state's breeding population. The heron forages on shallow flats and sandbars for fish species, including killifish. In Florida Bay, reddish egrets nest from November through May (FWC 2003c). Population declines of the species are attributed to loss and degradation of suitable habitat. Target nest numbers for snowy egrets and tricolored herons combined are 10,000 to 20,000 pairs. Nesting targets for the snowy egret and tricolored heron have not been met in the WCAs and ENP since the implementation of IOP in 2002. Nesting effort (number of nests) of these species from 2002 to 2008 is summarized as follows; 2000-2002: 8,614 pairs, 2001-2003: 8,088 pairs, 2002-2004: 8,079, 2003-2005: 4,085 pairs, 2004-2006: 6,410 pairs, 2005-2007: 4,400 pairs, 2006-2008 3,778 pairs(SFWMD 2009b). However, target numbers have not been met prior to the current operating regime; 1998-2000: 2,788 pairs, 1999-2001 4,270 pairs. Little blue heron censuses from aerial surveys are unreliable due to its dark plumage and tendency to nest in small, isolated colonies (FWC 2003c).

3.8.3.5.6 Roseate Spoonbill

The roseate spoonbill is the only spoonbill endemic (native) to the Western Hemisphere (Bjork and Powell 1996). This species can reach a length of 30-40 inches (76-102 centimeters) with a wingspan of 50-53 inches (127-135 centimeters). It has pink wings and underparts (with some red on the tops of the wings) with a white neck and back, and pinkish legs and feet. While the species looks almost entirely pink in flight, they actually have no feathers at all on their heads. The pink coloration comes from the organisms on which they feed, which are full of caroteniods (organic pigment) (Texas Parks and Wildlife Department, n.d.). As the name implies, the roseate spoonbill also has a large, spoon-shaped bill, which it sweeps back and forth in shallow water to capture prey.

Life History

The specialized bill has sensitive nerve endings which help the birds search for food in shallow water. The diet of the roseate spoonbill primarily consists of crayfish, shrimp, crabs, and small fish. There is no sexual dimorphism (difference in form between individuals of different genders in the same species) in roseate spoonbills. They nest in mixed colonies (near other wading bird species) in mangroves or trees and though most breed on the coast, some nest inland. Nesting habitats include coastal mangroves and dredged-made islands. (Florida Natural Areas Inventory 2001). The female builds the nest while the male retrieves the nesting materials. The female lays up to three whitish-colored eggs and both adults incubate the eggs for up to 24 days (Smithsonian National Zoological Park, n.d.). The young remain in the nest for approximately 35-42 days and are fed by both adults.

Habitat and Distribution

The roseate spoonbill is a resident breeder in South America, generally east of the Andes, and coastal areas of Central America, the Caribbean, and the Gulf of Mexico (Dumas 2000). Mangrove islands and occasionally dredge-spoil islands are the preferred nesting habitat for the species. In Florida, the species is found in Florida Bay, Tampa Bay, and Brevard County (**Figure 3-30**).

Figure 3-30 Roseate Spoonbill Distribution

Threats

One historical threat to the roseate spoonbill was hunting for their feathers, though this practice is now illegal which has allowed the population to rebound. Another threat to the spoonbill is the availability of adequate food sources and habitat degradation. In the Florida Bay, the increased fresh water flow from the Everglades may affect prey availability for the spoonbill. Other threats include habitat loss and disturbance, pesticides, and illegal shootings (Dumas 2000).

http://myfwc.com/wildlifehabitats/imperiled/profiles/birds/roseate-spoonbill/

3.8.3.5.7 Gopher tortoise

The gopher tortoise is a moderate-sized, terrestrial turtle that averages 9-11 inches (23-28 centimeters) long. This species of tortoise has a brown, gray, or tan upper shell (carapace), a yellow lower shell (plastron), and brown to dark gray skin (Florida Natural Areas Inventory 2001). Gopher tortoises have stumpy, elephant-like hind feet and flattened, shovel-like forelimbs that are used for digging burrows.

Life History

Gopher tortoises dig deep burrows that average 15 feet long (4.6 meters) and 6.5 feet (two meters) deep. These burrows provide protection from extreme temperatures, moisture loss, predators, and serve as refuges for 350-400 other species. Because so many other animals depend on the burrows (commensals), gopher tortoises are referred to as a keystone species. Gopher tortoises generally forage within 160 feet (48.8 meters) of their burrows but have been known to travel greater distances to meet their nutritional needs. Gopher tortoises feed on a wide variety of plants including broadleaf grasses, wiregrass, grass-like asters, legumes, blackberries, and the prickly pear cactus.

Gopher tortoises are slow to reach sexual maturity, have low reproductive potential, but they have a long life span – 60 years or longer. Females reach sexual maturity between 10-20 years of age. The breeding season is generally between March and October. Females lay five to nine eggs between May and June. Nests are excavated in areas of abundant sunlight, especially in the sand mound that is located in front of a burrow. Egg incubation lasts 80 to 90 days in Florida. Hatchlings are capable of digging their own burrow, but may use other tortoises' burrows instead (Gopher Tortoise Council 2000).

Habitat and Distribution

Gopher tortoises are found in the southeastern Coastal Plain, from southern South Carolina, southwest to extreme southeastern Louisiana (Florida Natural Areas Inventory 2001). In Florida, tortoises occur in parts of all 67 counties, but prefer high, dry sandy habitats such as longleaf pine-xeric oak sandhills (Figure 3-31). They also may be found in scrub, dry hammocks, pine flatwoods, dry prairies, coastal grasslands and dunes, mixed hardwood-pine communities, and a variety of disturbed habitats, such as pastures.

Figure 3-31 Gopher Tortoise Distribution

Threats

The primary threat to the gopher tortoise is habitat loss. Habitat alteration, such as urbanization, generally occurs in the same high, dry habitats that the tortoise prefers. Lack of appropriate land management (especially controlled burning) has also contributed to population declines in areas where natural habitat remains. Other threats include road mortality from vehicles and illegal human predation.

http://myfwc.com/wildlifehabitats/imperiled/profiles/reptiles/gopher-tortoise/

3.8.3.5.8 Gopher frog

The gopher frog is a stout-bodied frog that reaches a length of two to four inches (5.1-10.2 centimeters). This species has a cream to brown-colored body with irregular dark spots on its sides and back, a large head, warty skin, rounded snout, short legs, and a light brown ridge found behind its eyes (Florida Natural Areas Inventory 2001).

Life History

The diet of the gopher frog primarily consists of invertebrates and anurans (frogs and toads) (Godley 1992). The breeding season differs by geographical location, as the North Florida population breeds from February to June and the Central and South Florida population during the summer. Gopher frogs will travel long distances (up to a mile or more) to breed in temporary breeding ponds. Females lay eggs in shallow water in a single mass that can contain 3,000 to 7,000 eggs, which attach to vegetation when released. Once hatched, the tadpoles metamorphose in three to seven months. Gopher frogs usually reach sexual maturity at two years of age (Godley 1992, Palis 1998).

The call of a gopher frog is a deep guttural snore (the sound is developed in the back of the mouth) and heavy rains at any season may stimulate choruses, with many of them calling at once. Sometimes they call from underwater, so as not to attract predators, creating a noise that is detected only by a hydrophone.

Habitat and Distribution

The gopher frog inhabits longleaf pine, xeric oak, and sandhills mostly, but also occurs in upland pine forest, scrub, xeric hammock, mesic and scrubby flatwoods, dry prairie, mixed hardwood-pine communities, and a variety of disturbed habitats (Enge 1997). This species inhabits gopher tortoise burrows, which is how its name originated. Gopher frogs can be found throughout Florida (Map Data from: FNAI, museums, and gopher frog literature) (**Figure 3-32**).

Figure 3-32 Gopher Frog Distribution

Threats

The main threat to the gopher frog is the destruction of its habitat, especially breeding ponds. Exclusion and suppression of fire from wetlands often leads to degradation of breeding ponds through shrub encroachment, peat buildup, and increased evapotranspiration (evaporation of surface water and release of water vapor) from plants shortening the hydroperiods (LaClaire 2001). Coverage of grassy emergent vegetation decreases and peat buildup may acidify the water past tolerance levels of the gopher frog (Smith and Braswell 1994). Another threat to gopher frog populations is the introduction of game and predaceous fish into formerly fish-free wetlands during natural flooding events. The introduction of these fish causes increased predation of the gopher frog's eggs and tadpoles. The gopher frog also faces threats of disease, such as contraction of the *Anuraperkinsus* mesomycetozoan (yeast-like) pathogen - an infectious parasite.

http://myfwc.com/wildlifehabitats/imperiled/profiles/amphibians/gopher-frog/

3.8.3.5.9 Burrowing owl

The diet of the burrowing owl primarily consists of insects; however, they will also feed on snakes, frogs, small lizards, birds, and rodents. Nesting season occurs between October and May, with March being the primary time for laying eggs. Nesting occurs in burrows in the ground that they dig. These burrows will be maintained and used again the following year (Haug et al. 1993). Females lay up to eight eggs within a one-week period, and they will incubate the eggs for up to 28 days. Once the white-feathered juveniles are born, it takes two weeks before they are ready and able to appear out of the burrow. Juveniles will begin learning how to fly at four weeks, but will not be able to fly well until they are six weeks old. Juveniles will stay with the parents until they are able to self-sustain at 12 weeks old. Burrowing owls are different than other owls as they are active during the day time (diurnal) rather than at night (nocturnal) during breeding season. During the non-breeding season, they become more nocturnal.

Habitat and Distribution

Burrowing owls inhabit open prairies in Florida that have very little understory (floor) vegetation. These areas include golf courses, airports, pastures, agricultural fields, and vacant lots. The drainage of wetlands, although detrimental to many organisms, increases the areas of habitat for the burrowing owl. The range of the burrowing owl is throughout the peninsular of Florida in patches and localized areas. Burrowing owls can also be found in the Bahamas (Florida Natural Areas Inventory 2001).

Figure 3-33 Burrowing Owl Distribution

Threats

The burrowing owl faces many threats to its population. The main threat is the continued loss of habitat. Threats to habitat include construction activities development and harassment by humans and domesticated animals. Heavy floods can destroy burrows in the ground, which can cause the destruction of eggs and young. Other threats include increased predation by ground and aerial predators in the burrowing owl's habitat, and vehicle strikes.

http://myfwc.com/wildlifehabitats/imperiled/profiles/birds/burrowing-owl

3.8.4 MIGRATORY BIRDS

The A-1 project site supports migratory birds. Migratory birds are of great ecological and economic value to this country and to other countries. They contribute to biological diversity and bring tremendous enjoyment to millions of Americans who study, watch, feed, or hunt these birds throughout the United States and other countries. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act (Act), the United States has implemented these migratory bird conventions with respect to the United States. Executive Order 13186 of January 10, 2001 directs executive departments and agencies to take certain actions to further implement the Act. As stated in Executive Order 13186, each agency shall, to the extent permitted by law and subject to the availability of appropriations and within budgetary limits, (1) support the conservation intent of the migratory bird conventions and avoid or minimize impacts on migratory bird resources, (2) restore and enhance the habitat of migratory birds, as practicable, (3) prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable, (4) design migratory bird habitat and population conservation principles, measures, and practices into agency plans and planning processes as practicable and coordinate with other agencies and nonfederal partners, (5) ensure that agency plans and actions promote programs of comprehensive migratory bird planning efforts, (6) ensure environmental analysis of Federal Actions required by NEPA evaluate the effects of actions on migratory birds with emphasis on species of special concern, (7) provide notice to the USFWS in advance of conducting an action that is intended to take migratory birds, (8) minimize the intentional take of species of concern, and (9) identify where unintentional take reasonable attributable to agency actions is having or is likely to have a measurable negative effect on migratory bird populations. For a complete list of the requirements in the Executive Order, please refer to the Presidentail Documents, Federal Register, Volume 66, Number 11 dated January 17, 2001 *Responsibilities of Federal Agencies to Protect Migratory Birds.*

3.9 CULTURAL, HISTORIC AND ARCHEOLOGICAL RESOURCES

3.9.1 PROJECT SITE

The A-1 project site has been the subject of multiple cultural resource investigations to determine the presence of cultural, historical and archeological resources. In 2006, the State Historic Preservation Officer (SHPO) reaffirmed the findings from the December 2002 determination that no historic or cultural resource sites eligible for listing in the *National Register of Historical Places* (NRHP) were encountered on the A-1 project site and due to the site being heavily impacted by sugar cane and sod cultivation practices, no additional cultural resource investigations are necessary.

Most recently, the Florida State Bureau of Archaeological Research (BAR) on behalf of the SFWMD, conducted a Phase I Cultural Resource Assessment Survey (CRAS) of 16,593 acres of the EAA A-1 project area in July 2012, as part of the Central Everglades Planning Project (CEPP). This CRAS was intended to locate, identify, delineate, and evaluate cultural resources in advance of proposed landscape modification. The CRAS recommended no further archaeological work at the A-1 property at this time. (*A Cultural Resource Assessment Survey of the EAA A-1 Property, Palm Beach County, Florida, Bureau of Archeological Research, Division of Historical Resources, Department of State, State of Florida, September 2012).*

The EAA A-1 CRAS was undertaken to comply with Section 106 of the National Historic Preservation Act (NHPA) and Section 267 of the Florida Statutes. Section 106 of NHPA of 1966 (PL89-665, as amended) requires federal agencies to take into account the effects upon historic properties of projects involving federal funding, federal permitting, or occurring on federal lands. The Code of Federal Regulations (CFR) Title 36, Chapter VIII, Part 800 (36 CFR 800) contains the guidelines for fulfilling the provisions of Section 106. The study evaluated all potential cultural resources in the project area for eligibility for the NRHP. Cultural resources include archaeological, architectural, prehistoric, and historical sites and artifacts. Similarly, Section 267 of the Florida Statutes requires that "each state agency of the executive branch having direct or indirect jurisdiction over a proposed state or state-assisted undertaking shall, in accordance with state policy and prior to the approval of expenditure of any state funds on the undertaking, consider the effect of the undertaking on any historic property that is included in, or eligible for inclusion in, the National Register of Historic Places".

The July 2012 BAR CRAS of the EAA A-1 project area identified no cultural resources that they believed to be eligible or potentially edigible for listing in the NHRP. Investigations included both archival research and fieldwork and were designed to determine the presence of cultural resources. A search of archives in the Florida Master Site File (FMSF) revealed that there were no known archaeological sites or historic proterties within the project area. Fieldwork consisted of pedestrian walk-over survey with concurrent ground inspection and shovel testing to detect possible subsurface archaeological resources. The field methodology was tailored to the area's unique environmental conditions. As with other survey methodologies in the EAA (Carr 1974; Carr et al. 1996; Carr et al. 2000; Marks and Arbuthnot 2008; Smith 2007), investigations were focused on potential tree island locations (extinct or extant) and other landscape anomalies identified in modern and historic aerial imagery. Field crews found no cultural materials greater than 50 years old in any of the shovel test pits. The remains of the Talisman Sugar Mill (8PB15974), an agricultural facility that was constructed in 1962 and demolished in the late 1990s, were recorded.

The BAR concluded and the USACE agrees that the lack of significant (i.e. NRHP eligible) cultural resources in the EAA A-1 project area is likely because the inhospitable pre-drainage environment limited opportunities for extensive human occupation. Before drainage, the A-1 project site was in the Sawgrass Plains, a sparsely inhabited landscape that was covered in sawgrass and typically submerged under 1.5 ft of water (McVoy et al. 2011). Additionally, any archaeological sites, which may have been present, may have been destroyed through the decades of soil subsidence due to drainage and agriculture work that resulted in severe demucking. Some areas also likely lost soil due to oxidation and burning of dry muck due to over-drainage (FWCC 2002:10–11).

3.9.2 DOWNSTREAM AREAS

Within the larger region of the Everglades, there are numerous recorded archeological sites indicative of Native American habitation. Prior to European contact, the Everglades were a populated area. Native Americans traveled via canoe and on foot through the saw grass and inhabited many of the tree islands. The earliest known habitation sites date to the Early Archaic Period (7,500 BC) when the Everglades were much drier. However, within the larger area of south Florida, evidence of Paleo-Indian (12,000 to 7,500 BC) habitation has also been recorded (i.e. Warm Mineral Springs (8SO18) and Little Salt Spring (8SO79) (Griffin 1988). Some of the Early Archaic habitation sites have only recently been rediscovered as the result of managed drainage programs in south Florida. As the climate warmed and water levels rose, many Native Americans abandoned the lowest of the tree islands as they became submerged. This process continued through what is known as the Middle Archaic, until climate conditions stabilized around 3,000 BC at the start of the Late Archaic. Today many sites from both the Early and Middle Archaic Periods are no longer submerged and may have been utilized by more recent Periods.

After the Archaic Period, the region became incorporated into what is known as the Glades region and remained inhabited until the European arrived in the 1500's. Many of the tree islands through this portion of the Everglades have sites associated to the Glades Period. This Period has been broken down into successive stages starting with Glades I Period, which dates from 500 BC to 750 AD, Glades Period II dating from 750 to 1,200 AD, and Glades Period III dating from 1,200 AD to European contact in the 1,500s. Typical habitation sites through this region are identified by middens, which are the remains of the accumulation and disposal of daily life activities on these tree islands, or hammocks. Material remains may extend from the surface to well over one meter in depth. Native American burials may also be found among these hammocks.

The arrival of Europeans introduced Old World diseases to which the indigenous population has little or no resistance; that and slave raising further reduced the Native American until their populations were decimated. The Native American populations in the region remained at low levels until the early 18th Century when the Miccosukee Tribe of Indians of Florida (Miccosukee Tribe) and the Seminole Tribe of Florida (Seminole Tribe) moved into the area while fleeing the U.S. Army and U.S. Governments' forced relocation program. Many archeological sites associated with both the Miccosukee and Seminole Tribes are known to exist throughout the region.

The USACE has evaluated the downstream areas for the presence of cultural resource sites within STA 2, STA 3/4, WCA 2, and WCA 3. A review of the Florida Master Site Files' digital database has shown that there are no known cultural resource sites within STA 2, STA 3/4, WCA 2A and the upstream area WCA 1. The database has shown that WCA 2B contains three (3) sites, one of which is potentially eligible to be listed on the NRHP. WCA 3A contains 75 potential sites. As stated in the final EIS for the Everglades Restoration Transition Plan (ERTP), WCA 3A and 3B contains 109 reported archaeological sites – 18 of which were the subject of a cultural resource assessment survey. The remaining 91 potential sites were identified based on aerial analysis alone. There have been no significant studies produced as a result of any investigations on the 18 confirmed sites other than identification.

To understand the effects of hydrologic changes on cultural resources within the WCAs, the USACE is developing a predictive model to identify the effects on cultural resources, including an assessment of water management changes in the WCAs. This effort will take multiple years to complete and as such USACE will be implementing a Programmatic Agreement (PA) as specified under ER 1105-2-100 Appendix C4(5)(d)(2) and 36 CFR 800.14b(1)(ii). The PA will allow USACE to complete needed studies on cultural resources within the WCAs.

3.10 TRIBAL RIGHTS

3.10.1 OVERVIEW OF SEMINOLE TRIBE WATER SUPPLY SOURCES

The Seminole Tribe has surface water entitlement rights pursuant to the 1987 Water Rights Compact (Compact) between the Seminole Tribe, State of Florida, and the SFWMD (Pub. L. No. 100-228, 101 Stat. 1566 and Chapter 87-292 Laws of Florida as codified in Section 285.165, F.S.) The Compact contains a series of provisions regarding establishment of Tribal water rights. Specifically, several "entitlements" to surface water were created. Additional documents addressing the Water Rights Compact entitlement provisions have since been executed. These documents include Agreements between the Seminole Tribe, SFWMD, and a SFWMD Final Order.

According to the Compact, the surface water entitlement for the Big Cypress Reservation is based on the percentage of water available within the South Hendry County / L-28 Gap Water Use Basin as the lands of the Big Cypress Reservation are proportional to the total land acreage within the identified basin. The Compact does not address water supply for sustaining tribal natural resources and customary usage rights. The specific volume of water associated with this entitlement was quantified in the 1996 Compact Agreement [1996 Agreement (Appendix O)] between the SFWMD and Seminole Tribe. The 1996 Agreement was precipitated by SFWMD implementation of the Everglades Construction Project (ECP), as required by Section 373.4592, Florida Statutes. Implementation of the ECP diverted surface water from the C-139 Basin and C-139 Basin Annex for treatment, thereby removing a portion of the Seminole Tribe's Big Cypress Reservation surface water entitlement from direct availability for Tribal use. The SFWMD agreed in the 1996 Agreement to first quantify this entitlement volume and protect the Compact right by providing replacement water supplies, as a secondary source, to offset the partial diversion of the entitlement amount. A study was conducted that quantified the Seminole Tribe's entitlement at 47,000 acre-feet per year to be distributed to the Reservation in 12 equal monthly amounts of 3,917 acre-feet. The entitlement right is to be perfected through the annual work plan process. Further, this entitlement volume is to be delivered primarily from the original entitlement source, the North and West Feeder Canals. Only when these volumes are insufficient, reliance on the secondary supply source, the G-409, is appropriate. To accomplish this delivery hierarchy, as well as to appropriately deliver water to the Big Cypress Reservation, an operational plan was developed and has been consistently implemented since 2003.

3.10.2 EXISTING WATER FLOW

Water supply deliveries to the Big Cypress Reservation are made from the North and West Feeder Canal systems via the G-409 pump station located just west of the northwest corner of WCA 3A. Sources of water for this pump station include Lake Okeechobee (delivered via the G-404 pump station), STA 3/4, STA-5, STA-6, Rotenberger and Holey Land WMAs, EAA Runoff, and WCA 3A. Supplemental flows to the Big Cypress Reservation, when demand is not met by the primary supply, are provided from the Miami Canal via G404 and G409. Existing conditions for flows into STA Flow-ways 5-1, 5-2, 5-3, 6-1, and 6-2 are provided from the C139 and C139 Annex Basins. The inflows are currently distributed into the STAs via the L-2/L-3 canal system by impounding water at G-407 in the vicinity of confusion corner (**Figure 3-34**). Inflows into the STAs are treated before discharge into the STA-5/6 discharge canals. The treated flows are directed to the WCA 3A via the L- 4 and Miami Canals. Any flow that cannot be accommodated in the STAs is diverted through G406/G407 into the L-4, similar to past operations.

3.10.3 WCA 3A TRIBAL RIGHTS

The Miccosukee Tribe holds a perpetual leasehold to an 189,000-acre tract of land within the northwest portion of WCA 3A (**Figure 3-35**). The purpose of the lease is to (1) preserve the Leased Area in its natural state for the use and enjoyment of the Miccosukee Tribe and the general public, (2) to preserve fresh water aquatic wildlife, their habitat, and (3) to assure proper management of water resources. The Miccosukee Tribe is allowed to use this land for the purposes of Traditional Cultural Practices (TCP), which include hunting, fishing, frogging, subsistence agriculture, and other activities that are dependent on wet conditions.

The Seminole Tribe also has rights to lands within WCA 3A. In 1989, 14,720 acres in WCA 3A were purchased from the Seminole Tribe with funds from the SFWMD and the Conservation and Recreational Lands (CARL) Program. This tract was added as an amendment to the Rotenberger Wildlife Management Area lease, which names the FWCC as a lead managing agency. The Compact recognized the special status of the Seminole Tribe by acknowledging rights and obligations substantially different from those of other Floridian citizens. The Seminole Tribe has retained non-exclusive rights to utilize the 14,720 acres of land in WCA 3A to hunt, trap, fish and frog. The Seminole Tribe also has full rights of access to the lands in WCA 3A. This amendment has a perpetual flowage easement granted to the SFWMD for the flowage and storage of water.

Public Law 93-440 states that members of the Miccosukee and Seminole Tribes shall be permitted, subject to reasonable regulations established by the Secretary, to continue their usual and customary use and occupancy of Federal or Federally acquired lands and waters within the WCA 3A, including hunting, fishing, trapping on a subsistence basis and traditional tribal ceremonies.

Figure 3-34 Water Flows to Big Cypress Indian Reservation

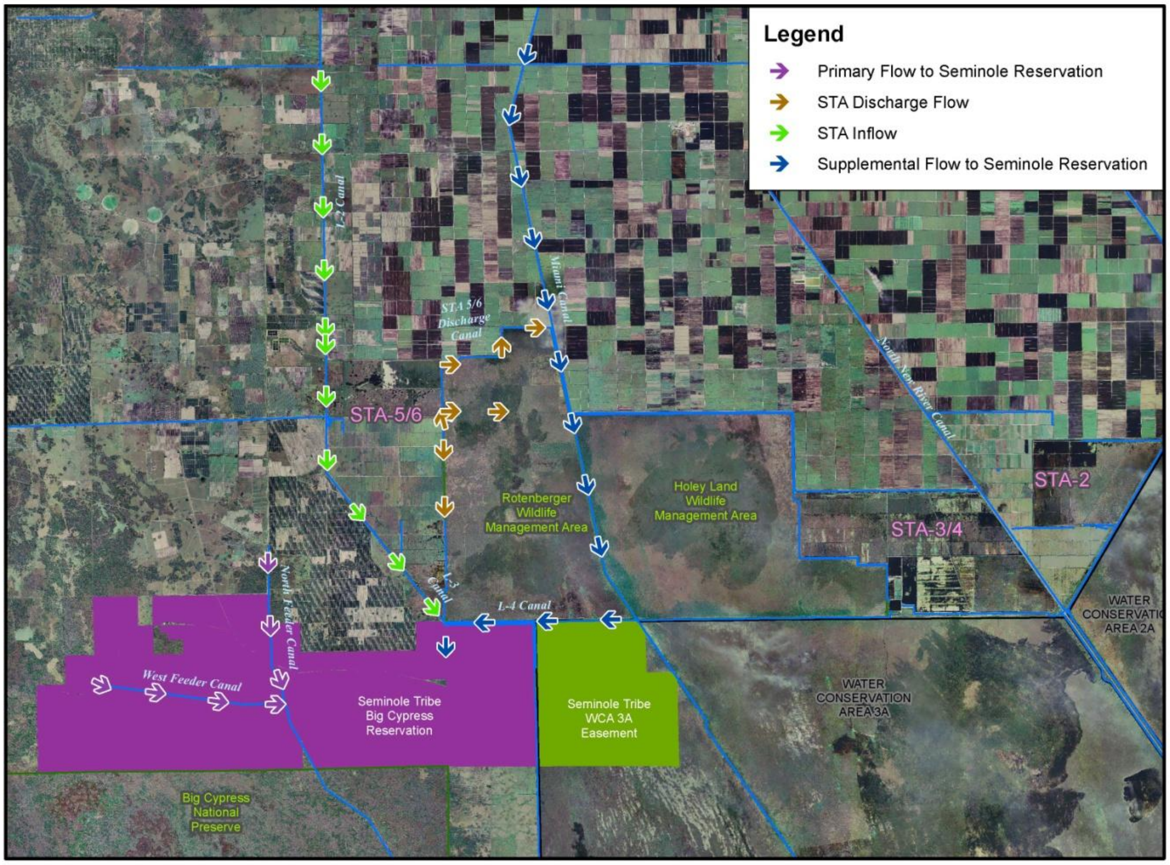


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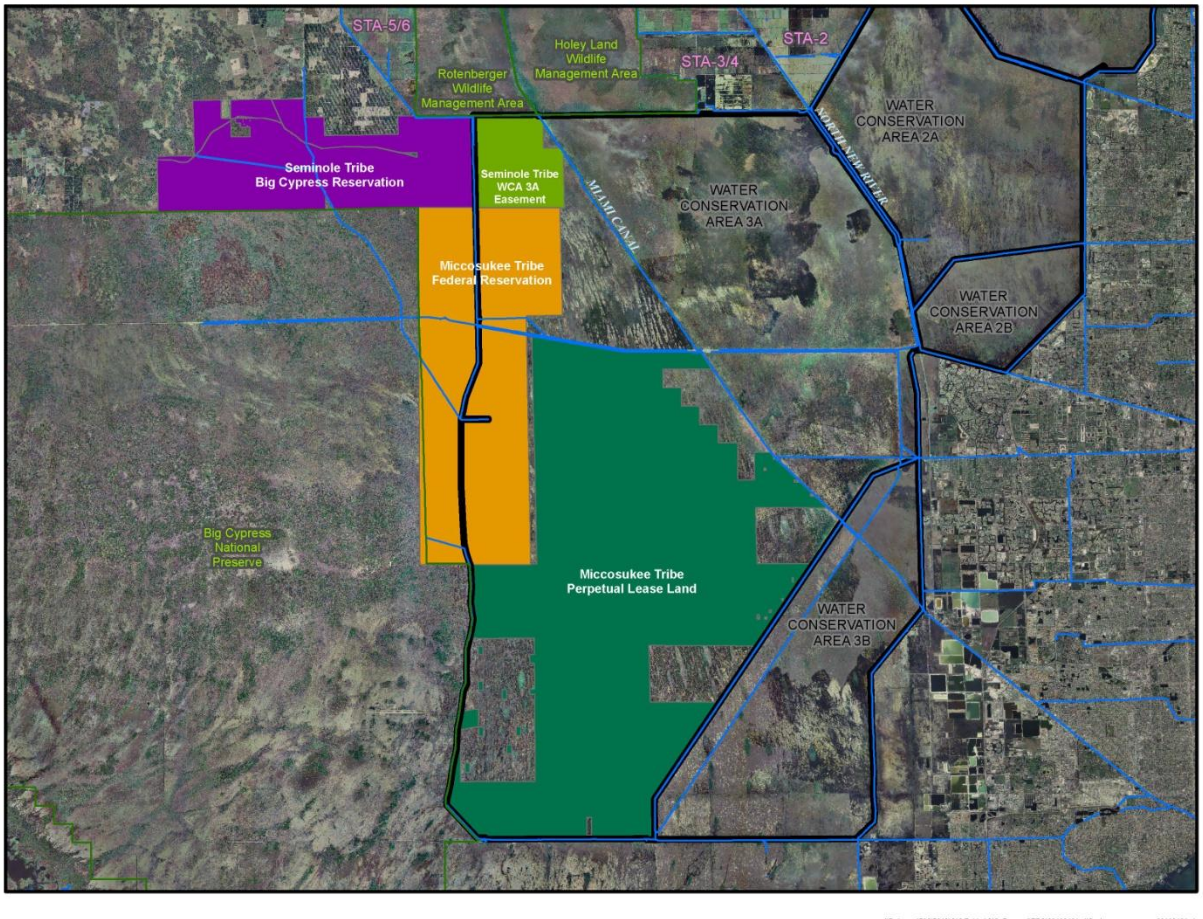
Figure 3-35 Location of the lands leased by the Miccosukee Tribe of Indians of Florida within WCA 3A



3.11 RECREATIONAL RESOURCES

Recreational opportunities are based on a variety of resources, including the waterbodies within the area and several extensive tracts of publicly owned lands. The recreational lands are primarily the existing STAs, which are managed by SFWMD for water quality purposes, or Wildlife Management Areas (WMAs), which are managed by FWCC for public use (primarily hunting and fishing). FWCC also manages hunting within the STAs with a cooperative agreement with SFWMD. The STAs are highly managed and as such public access is limited with no motorized uses allowed within the STAs. Public access, including a variety of motorized uses is permitted in the WMA areas. Due to consistent water levels and managed vegetation, the STAs are abundant in wildlife and are highly desired hunting destinations. The many levees within the STAs allow hiking, biking and limited vehicle access whereas the WMAs are vast without internal levees and are accessed with airboats and tracked vehicles. Overall the STAs and WMAs offer the public a variety of recreational activities that can include hunting, fishing, camping, wildlife observation, interpretation, hiking, bicycling, canoeing, and air boating. The recreational areas within the study area are discussed below.

3.11.1 PROJECT SITE

Currently the project site does not offer any recreational use as it is not open to the public.

3.11.2 STORMWATER TREATMENT AREAS 2 AND 3/4

Hunting is permitted in STA 2 and STA 3/4 and bird watching is allowed in STA 3/4. Recreational plans developed for the STAs ensure that permitted recreational uses are consistent with the primary STA goal of improving water quality.

The STA 3/4 recreational facility, known as the Harold A. Campbell Public Use Area, is located within the footprint of STA 3/4, between the Griffin Rock Pits and Cell 2B. The location of the public use area minimizes public access past the STA’s water control structures and data equipment. The Harold A. Campbell Public Use Area includes a vehicle barrier gate, road improvements, a boat ramp, asphalt parking area, an information kiosk (sheltered), landscaping, a multi-purpose bridge, and a composting toilet. The public has access to a 4-mile loop trail during daylight hours on designated days. The boat ramp allows 7-day access during daylight hours to the external canals of STA 3/4 and those canals along the south side of the L-5 levee for a total of 27 miles of fishable canals. FWCC manages waterfowl and alligator hunting in STA 3/4 and STA 2. STA 2 provides access from US Highway 27 through to the WCA 2 and allows fishing along this route. A boat ramp and parking area are located on the east at the shared boundary of the WCA 2 for access into the L-6 Canal.

3.11.3 WATER CONSERVATION AREAS 2A AND 3A

The Everglades-Francis S. Taylor WMA includes WCAs 2A, 2B, and 3A and is located immediately southeast and south of the EAA. The Everglades-Francis S. Taylor WMA is separated from adjacent areas by water control levees and canals, and its hydrology is highly managed. Its 671,831 acres of primarily Everglades marsh buffers ENP and Big Cypress National Preserve from agriculture in the EAA. The main recreational activities within the WMA include hunting, fishing, frogging and air-boating in the interior areas. The levees and canals also provide opportunities for fishing, frogging, hiking, biking, and wildlife viewing. Common access to the western area of WCA 2A and the L-6 Canal between the S6 and S7 pump stations is through the southern portion of STA 2 across the sportsman’s crossing. Access to WCA 3 occurs along the north and south boundaries at multiple locations, but the prime access is on the east at Broward County's Holiday Park. The Miccosukee Tribe and the Seminole Tribe also maintain rights to land within WCA 3A. The Tribes have rights to use this land for the purposes of hunting, fishing, frogging, subsistence agriculture, and other activities.

3.11.4 HOLEY LAND WILDLIFE MANAGEMENT AREA

Currently, state agencies (FWCC, SFWMD, and FDEP) are developing an updated management plan to address goals and objectives for restoration of the Holey Land. Recreation includes hunting, fishing, camping, frogging, hiking, and biking. The Holey Land Restoration project that began in 1991 increased the hydroperiod in this WMA. In response, the primary recreational use in the Holey Land changed from hunting deer and feral hog to fishing in perimeter canals and hunting waterfowl (USACE and SFWMD 2006).

3.12 AESTHETICS

The A-1 project site is composed of lands that were historically used for sugar cane farming, with the occasional rotational crop of rice or corn. The site is currently vacant and fallow; the majority of the project lands were formerly part of the EAA A-1 Reservoir project, which was partially constructed before construction was halted due to budgetary and other issues. Construction was halted in 2006 and much of the land has reverted to natural wetland characteristics since that time.

The visual landscape of the STAs and WCAs is overwhelmingly flat. Landscape features include typical canals, levees and prairie wetland communities. The STAs and WCAs offer opportunities for observation of migratory game birds during winter months. Although some of the marshlands have been degraded in visual quality by over-flooding and loss of tree islands, other areas, such as the south-central region of WCA 3A, still preserve good examples of original, undisturbed Everglades' communities, with a mosaic of tree islands, wet prairies, sawgrass expanses, and deeper sloughs. From the elevated viewpoint of the Eastern Perimeter Levee system, the view westward to the marshes is panoramic, though mostly homogenous.

3.13 FLOOD PROTECTION

Runoff from the EAA is collected and routed to the WCAs for flood control (SFWMD 2004). The STAs and WCAs are integral components of the flood protection system in South Florida. STAs work in conjunction with the WCAs to provide flood storage. Runoff from Everglades Tributary Basins is directed first into the STAs, then discharged from the STAs and directed to the WCAs. The flood storage capacity of the WCAs is essential to flood control in the EAA.

3.14 HAZARDOUS AND TOXIC WASTE

Although the project site is no longer in active agriculture use, the past farming activities could have resulted in contamination on the site. Phase I and Phase II environmental site assessments (ESAs) provide a comprehensive overview of the properties and identify point sources including chemical storage and mixing areas, agrochemical and petroleum storage tanks, refueling and maintenance areas, and residual agrochemicals and soil addenda in cultivated areas.

The Phase I and Phase II ESAs identified five tracts of land with potential to contain contaminated soil, groundwater, or surface water (**Figure 3-36**). These tracts are:

- Woerner Farm 3 (Southern 1/3) – Tract No. 100-039
- Talisman South Ranch (Eastern 1/3) – Tract #100-104
- Talisman Mill – Tract
- Cabassa Farm – Tract #100-105
- Farm 21 (northern portion) – Tract #100-020

A description of each tract is described below:

Woerner Farm 3- Tract # 100-039

Tract #100-039 consists of approximately 966 acres of land; however, only approximately 330 acres of the property will be used within the project footprint, plus a small area to the northwest of the FEB footprint that will be used for a construction yard. The northern 2/3 of the property will be outside the project footprint and will serve as a buffer area. The norther 2/3 of Tract #100-039 is currently fallow land, but was historically used for production of vegetables, turfgrass and sugar cane. As part of the previous abandoned EAA Reservoir construction, the east side of the property was utilized as a construction yard and office complex by the contractor. No exit assessment was performed at the time the contractor vacated the property. The southern 1/3 of Tract #100-039 is within the project footprint and has been scraped of soil. The majority of this southern 1/3 portion of the property within the project footprint is now a part of the seepage ditch that was constructed for the EAA reservoir.

The following assessments and investigations were conducted for Tract 100-039:

- A Phase I Environmental Site Assessment - November 1994 and January 1998
- Phase II ESA investigation - February 1999
- Supplemental investigations – February 2000, March 2001, May 2002

- Toxaphene Risk Assessment – October 2005

Three point source areas of concern, including a pump station, a pesticide storage shed, and a pesticide spill area were identified on the eastern portion of the project and required additional assessments and/or corrective actions (Figure 3-37). In 2005, over 1,880 tons of toxaphene impacted soils were excavated from a pesticide spill area. A limited soil excavation of pesticide and petroleum impacted soils was conducted at the former shed on the Woerner tract. In addition 130 tons of petroleum impacted soils were excavated from the main pump station. Concurrence from completion of the remedial activites was obtained from FDEP on all of these point source areas.

In addition to the point source areas, toxaphene was identified throughout the entirety of Tract #100-039 at concentrations that pose a potential ecological risk. An Environmental Risk Assessment (ERA) was prepared and USFWS reviewed the ERA and recommended that SFWMD either conduct corrective action to remove the contaminated soils or avoid inclusion of this tract within the former EAA reservoir boundary. The majority of the portion of Tract 100-039 within the project footprint was scraped of surficial soils during the abandoned EAA reservoir construction and the toxaphene impacted soils may have been largely removed by the scraping. The Woerner Farm 3 site was resampled in 2012 to determine the levels of toxaphene. Four out of the five samples exhibited an average of 60-70% degradation in toxaphene concentrations since 2000, while the fifth sample site exhibited 15% less toxaphene concentrations. Additional sampling is required on this tract to verify that toxaphene concentrations in the remaining soils are below ecological risk thresholds and to verify the disposition of the scraped soils.

Figure 3-36 Location of Potential Point Sources

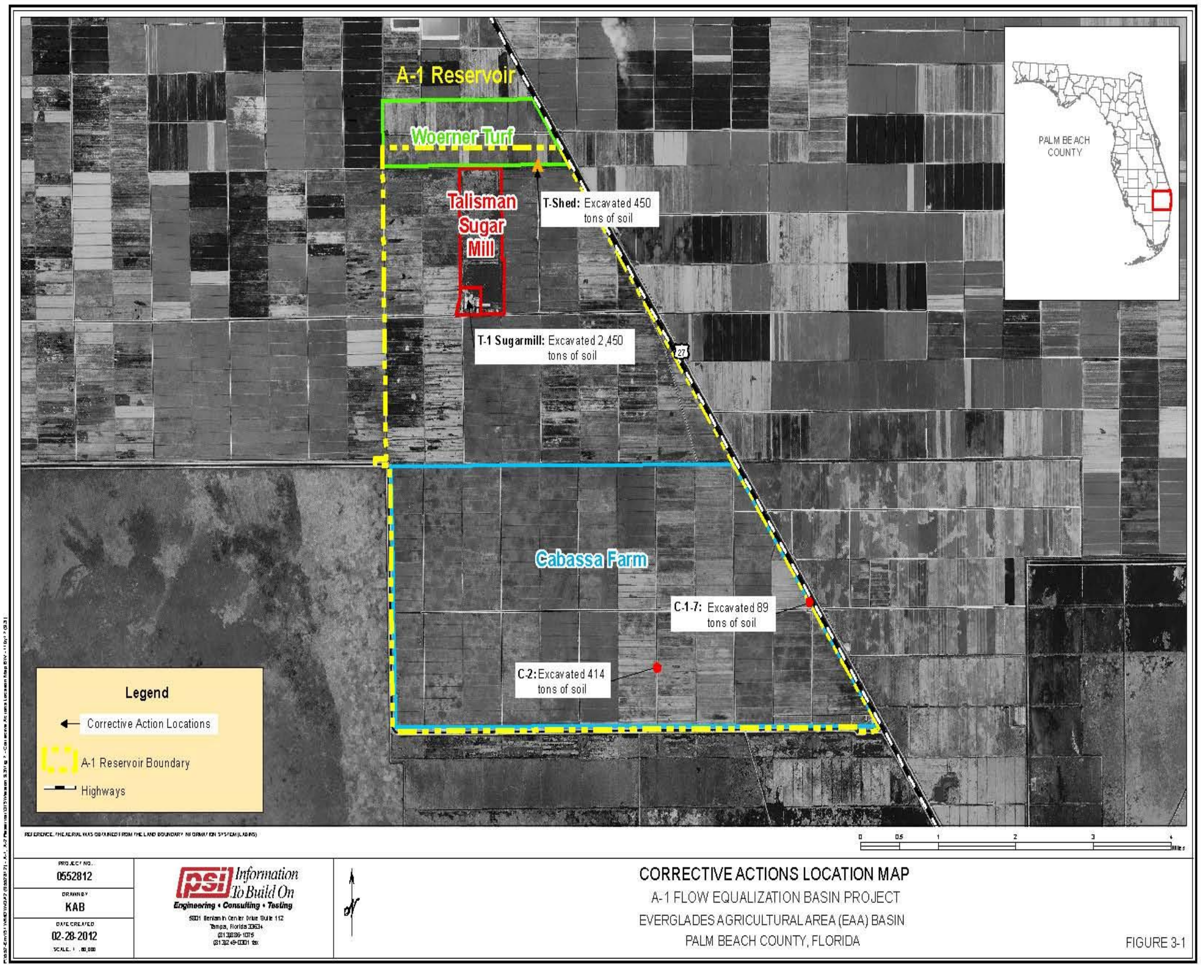
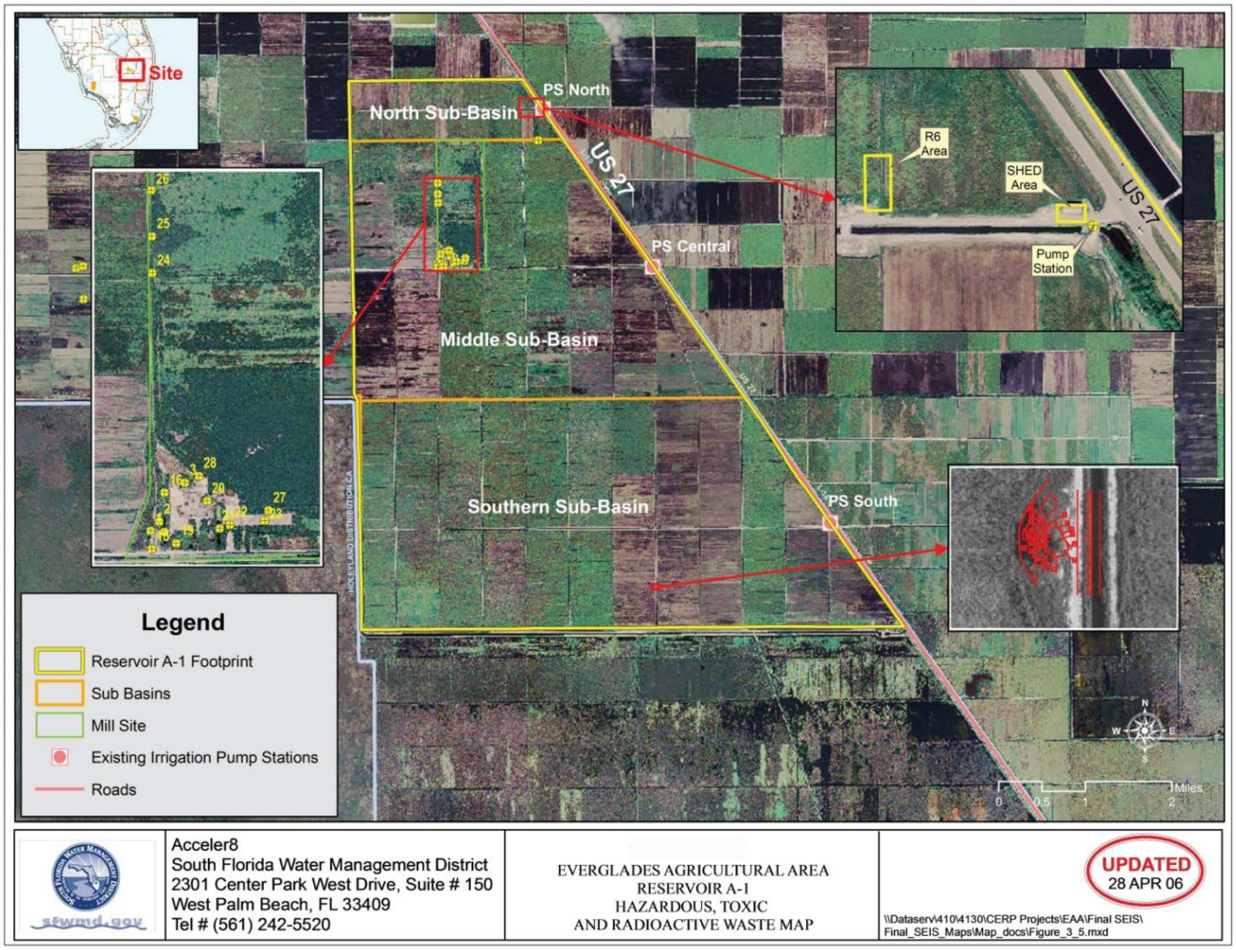


Figure 3-37 Potential Sites with Potential Contaminated Areas



Talisman South Ranch (Eastern 1/3) –Tract #100-104

This property consists of approximately 20,525 acres that has been used for the cultivation of sugar cane since the mid-1960s; however, only an approximate 6,052 acre portion of the property is within the current project footprint.

Phase I and Phase II ESAs were completed in 1998 for the Talisman South Ranch, including both Tract #100-104 and Tract #100-029 (Talisman Mill). No sampling was conducted as part of the 1998 Phase II ESA for the Talisman South Ranch to evaluate residual agrochemical impacts within the cultivated areas. The Phase I and Phase II ESA's identified only one point source area within the A-1 FEB project footprint that required remediation. This point source area (T-SHED) was remediated and a Site Rehabilitation Completion Order (SRCO) was issued by FDEP. Some contaminated soils containing arsenic concentrations above the FDEP residential cleanup target level, but below the commercial cleanup target level were allowed to remain in place. An institutional control (deed restriction) was recorded on this area preventing use of this area for residential or other sensitive purposes. The point source area location is shown on Figure 3-37.

Subsequent to the acquisition of Tract #100-104 by SFWMD, the District conducted follow-up site inspections on the property in 2007 and in 2009, when an agricultural lease on the property expired and the tenant vacated the property. No additional issues were identified during these assessments.

Additionally, SFWMD has recently conducted soil sampling within previously cultivated areas to identify whether any residual agrochemicals are present. Copper was identified in only one of fifteen composite samples at concentrations exceeding the USFWS Interim Screening Level (ISL) of 85 mg/kg. However, the average copper concentration is below the USFWS ISL and the ecological risk associated with copper is believed to be low. Additional soil samples indicate that copper was detected at concentrations that exceed 85 mg/kg in 30% of the samples collected; however the exceedances represent less than 6% of the total project area. Arsenic was also detected in the cultivated areas across the entirety of the site at concentrations exceeding the FDEP residential SCTL, but below the commercial SCTL and the ecological risk threshold. Arsenic is ubiquitous throughout the EAA at similar or higher concentrations and may be associated with farming activities or natural background.

Talisman Mill – Tract #100-029

Tract #100-029 encompasses 530.7 acres and includes the former sugar mill and associated wastewater ponds. The northern portion of the property is improved with a series of bermed infiltration ponds and water management canals. These areas were formerly utilized for sugar cane production, until creation of the infiltration ponds. The southern portion of the property was formerly developed as a sugar mill. Improvements to this area of the property included a sugar mill, associated offices, warehouses, above ground storage tanks, a fleet fueling area, a scalehouse, a cane washing area and other related improvements. The sugar mill and ancillary structures were demolished under the direction of Conestoga Rovers and Associates (CRA) in 1999. Prior to mill demolition, all hazardous materials were removed and properly disposed off-site. All of the petroleum storage tanks were cleaned and removed.

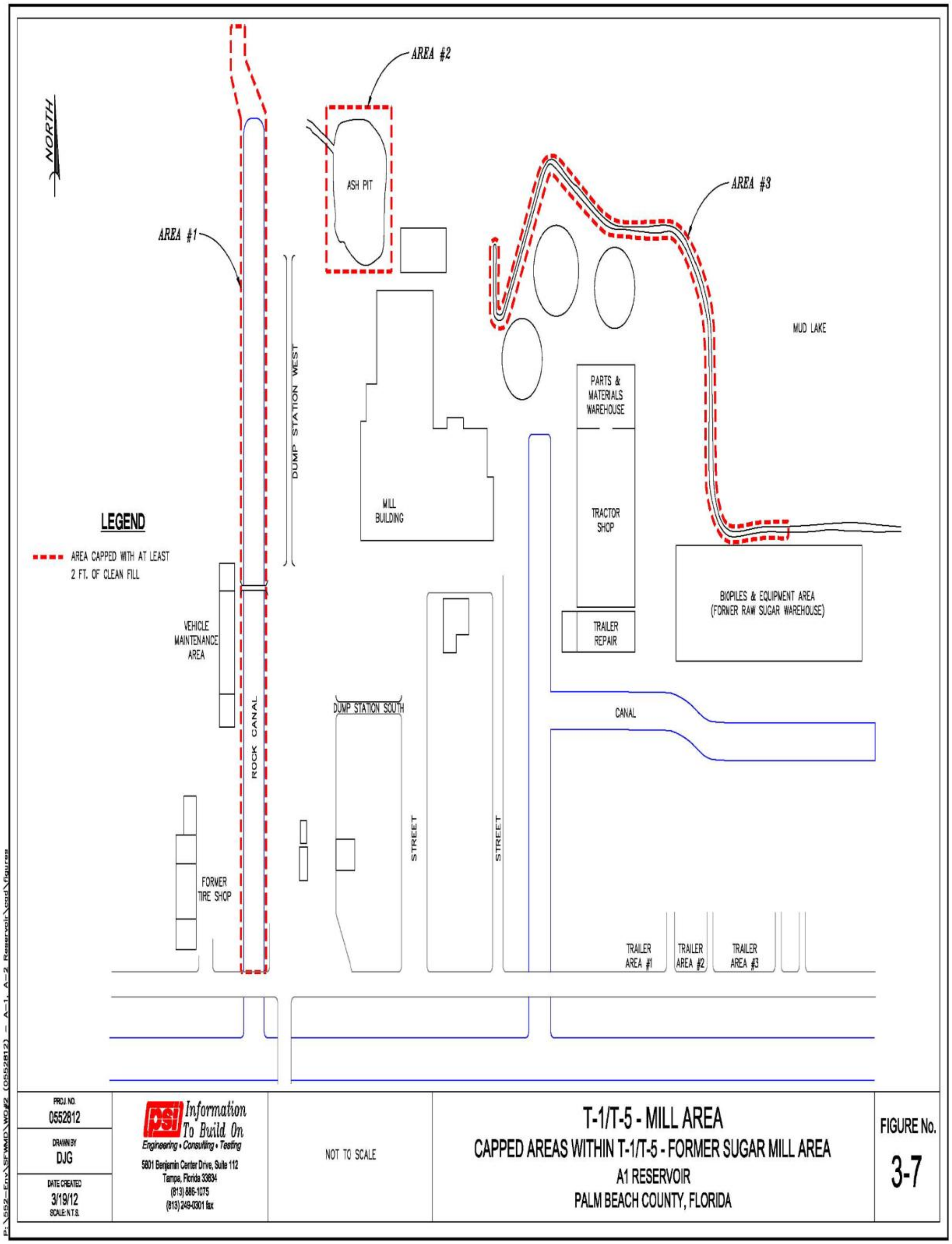
A Phase I and Phase II ESA was completed on both Tract #100-029 and Tract #100-104 in 1998. The Phase I ESA identified 27 separate potential point source areas within Tract #100-029 and all of these areas were investigated as part of the Phase II ESA. Areas of concern at the mill site included numerous leaking petroleum storage tanks, pesticide and/or arsenic impacted soils in the sediments of two drainage canals, an ash pit, and a water storage retention area, and metals-impacted soils adjacent to several building slabs.

Contaminated soil and/or groundwater were identified in 19 of these areas, which were subsequently remediated by the property owner. The assessment and remediation of these point source areas was documented in a number of different reports prepared by PSI dating from 2000 to 2003. Upon completion of the remediation of all of the point source areas, FDEP issued a single SRCO for the entirety of Tract #100-029.

Contaminated soil exceeding the FDEP residential soil cleanup target levels (SCTLs), but below the commercial SCTLs and ecological risk thresholds was allowed to remain in place throughout the tract. Additionally, contaminated soils exceeding the commercial SCTLs and ecological risk thresholds were consolidated in three small areas within the mill and were capped with 2 feet of clean soil to prevent future exposure of the soil to wildlife or people. The locations of these capped areas are shown on Figure 3-38. These areas should not be disturbed during construction, but should pose no significant risk during or after project construction, if left undisturbed. A deed restriction was placed on the entirety of Tract #100-029 to prevent its use for residential or other sensitive purposes. Additionally, the deed restriction prohibits disturbance of the cap in the previously mentioned contaminated soil consolidation areas.

In summary, all of the physical assessment and remediation intended by SFWMD has been completed on all of the point source areas within Tract #100-029 and all of the technical documents relating to the cleanup have been reviewed and accepted by FDEP. No additional assessment, corrective actions, or closures are required on this property.

Figure 3-38 Capped Areas within Former Sugar Mill



Cabassa Farm –Tract #100-105

The Cabassa Farm property consists of approximately 8,846 acres. This property was historically used for the cultivation of sugarcane while the far southeast portion used for rice cultivation. A Phase I and Phase II ESAs were conducted in February and March 1999, respectively. The Phase I and Phase II ESAs identified three point source areas of concern that required additional assessment and/or corrective actions including an equipment maintenance area, a cane loading/equipment staging area, and a permanent pump station (C-1-7).

The pump station was assessed and remediated, as document in a 2002 Site Rehabilitation Completion Report. An SRCO was subsequently issued for the pump station by FDEP. Additionally, an emergency response cleanup and assessment was conducted at another pump station on the Cabassa property in 2001, which was also granted closure and SRCO by FDEP.

A Contamination Ecological Risk Assessment and Corrective Action Report was prepared in January 2002 for this property, which summarized the assessment and remediation activities associated with the areas of concern. As part of the report, a number of composite soil samples were collected from the cultivated aeas, as sampling of the cultivated areas was not included in the 1999 Phase II ESA. Relatively low levels of copper, zinc, and organochlorine pesticides were detercted in the cultivated area soil samples. The results of the ERA concluded that the residual concentrations of pesticides, copper, and zinc were not a threat to representative fish and wildlife species. FDEP concurred with SFWMD's recommendation for No further Action (NFA) for the equipment maintenance area and the cane loading/equipment staging area and the USFWS provided concurrence that the residual agrochemical concentrations in the cultivated crop area did not pose a significant ecological risk.

An abandoned AST was identified during construction of the EAA reservoir on Tract #100-105, which was subsequently removed. A tank closure assessment was performed which did not identify any soil or groundwater contamination and an SRCO was subsequently issued by FDEP.

An exit assessment was performed on Tract #100-105 in 2009, when the agricultural lease on this property expired and the property was vacated by the tenant. Six soil samples were collected to compare the current concentrations to the pre-lease conditions. The report concluded that the agricultural lease operations did not adversely impact the property. USFWS and FDEP both provided concurrence with this report.

No additional assessment, corrective actions, or closures are required on this property.

Farm 21 - Tract #100-020

Tract 49100-020 (Farm 21) is a 3,441 acre parcel that was formerly operated by Okeelanta for sugar cane cultivation. However, only a small 206.9-acre strip on the north side of this tract is included within the A-1 FEB project footprint. A Phase I-II ESA was prepared for Tract #100-020 in 1999. No point source concerns were noted within the portion of Farm 21 that is within the current project footprint; however, numerous concerns were identified to the south, outside the project footprint. Since no concerns were identified on the portion of the property that is within the project footprint, no soil or groundwater samples were collected in this area.

A Contamination Assessment, Ecological Risk Assessment, and Corrective Action Report for STA-3/4 was prepared in 2002, which included Tract #100-020, as well as the Cabassa Farm (Tract 100-105) to the north. This assessment included the collection of four composite soil samples from Tract #100-020. No significant impacts were detected. The Ecological Risk Assessment, which is discussed above for Tract 100-105 also covered Tract #100-020 and concluded that there were no significant ecological risks associated with residual agrochemical impacts on this tract. In summary, no additional assessment, corrective actions, or closures are required on this property.

Corrective Actions on the A1 Property:

Numerous environmental reports addressing assessment and corrective action activities have been prepared for each of these tracts. All of these reports are discussed in the A-1 Flow Equalization Basin Summary Environmental Report, dated September 10, 2012, prepared by Professional Service Industries, Inc. (PSI). The Summary Environmental Report also includes a discussion of regulatory review and concurrence on each tract. Information on these reports can be found at the SFWMD's FTP directory at:

ftp://ftp.sfwmd.gov/pub/febeis/A1_summary_report/

FDEP provides primary oversight for point source spills or releases while the United States Fish and Wildlife (USFWS) provides primary oversight for ecological risks. All of the potential point sources within all five tracts have been investigated, remediated as necessary, and have been granted closure by the FDEP by letter dated April 14, 2013 (Appendix J). The USFWS has provided concurrence that no significant ecological risks associated with residual agrochemicals are present on Tracts #100-105 and #100-020. The USFWS issued separate concurrence on the entire A-1 FEB project site by letter dated April 17, 2013 (Appendix J), pending confirmation on remediation of toxaphene impacted soils from the lower 1/3 of the Woerner Farm 3 property and with the understanding that the SFWMD will implement a USFWS-approved start-up monitoring plan for copper which includes surface water, periphyton, and apple snails should they occur onsite.

3.15 CLIMATE

The subtropical climate of South Florida, with its distinct wet and dry seasons, high rate of evapotranspiration, and climatic extremes of floods, droughts, and hurricanes, represents a major physical driving force that sustains the Everglades while creating water supply and flood control issues in the agricultural and urban segments.

Seasonal rainfall patterns in South Florida resemble the wet and dry season patterns of the humid tropics more than the winter and summer patterns of temperate latitudes. Of the 53 inches of rain that South Florida receives on average annually, 75 percent falls during the wet season months of May through October. During the wet season, thunderstorms that result from easterly trade winds and land-sea convection patterns occur almost daily. Wet season rainfall follows a bimodal pattern with peaks during May through June and September through October. Tropical storms and hurricanes also provide major contributions to wet season rainfall with a high level of interannual variability and low level of predictability. During the dry season (November through April), rainfall is governed by large-scale winter weather fronts that pass through the region approximately weekly. However, due to the variability of climate patterns (La Nina and El Nino), dry periods may occur during the wet season and wet periods may occur during the dry season. High evapotranspiration rates in South Florida roughly equal annual precipitation. Recorded annual rainfall in South Florida has varied from 37 to 106 inches, and interannual extremes in rainfall result in frequent years of flood and drought.

Greenhouse gasses produced on the project site as a result of past rock mining and agriculture are primarily carbon dioxide, while other gasses include methane, nitorous oxide, and chloroflourocarbons. According to EPA's 2009 Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007, "Executive Summary," "the primary greenhouse gas emitted by human activities in the United States was CO_2 [carbon dioxide], representing approximately 85.4 percent of total greenhouse gas emissions" (EPA 2009). The carbon dioxide produced on the A-1 project site is prodiced from onsite hauling, offsite hauling by truck and rail, and rock quarry equipment.

3.16 COST

The SFWMD has incurred costs with the previous construction from the EAA A-1 Reservoir. These are defined as sunk costs (costs already incurred) for the land and initial earthwork that was conducted and is currently $180,000,000. The SFWMD also conducts routine vegetative maintenance and maintains measures that prohibit public access on the site.

3.17 ENVIRONMENTAL JUSTICE

Under Executive Order 12898, Federal agencies are responsible for identifying and addressing potential disproportionately high and adverse human health and environmental effects on minority and low-income populations. Minority persons are those who identify themselves as Hispanic or Latino, Asian, Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or multiracial (with at least one race designated as a minority race under Council on Environmental Quality (CEQ) guidelines (CEQ 1997). Persons whose income is below the Federal poverty threshold are designated as low income.

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant (as defined by the National Environmental Policy Act [NEPA]) and appreciably exceeds the risk or exposure rate for the general population or for another appropriate comparison group (CEQ 1997). A disproportionately high environmental impact that is significant (as defined by NEPA) refers to an impact or risk of an impact on the natural or physical environment in a low-income or minority community that appreciably exceeds the environmental impact on the larger community. Such effects may include ecological, cultural, human health, economic, or social impacts. An adverse environmental impact is an impact that is determined to be both harmful and significant (as defined by NEPA).

For the environmental justice analysis for this EIS, the project area was examined. The project area is composed of the EAA, which is composed mainly of agricultural lands.

3.18 NATURAL OR DEPLEATABLE RESOURCES

The A-1 project site has been previously utilized for sugar cane and sod farming, but currently the site is not being farmed. Remnant agricultural and remnant infrastructure still exists throughout the site including agricultural ditches and degraded roads. As a result of permitted construction activities to construction the A-1 Reservoir, the SFWMD has excavated rock material on the project site. Limestone, composed of the mineral calcite, is the primary rock formation which is appropriate for use in building materials and as aggregate for road beds.

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CHAPTER 4
ENVIRONMENTAL EFFECTS

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4.0 ENVIRONMENTAL EFFECTS

4.1 INTRODUCTION

This chapter provides a discussion of the potential environmental effects, which can be either positive or negative, that could result from implementation of the Alternatives. A detailed description of the alternatives is provided in Chapter 2. The evaluation of the effects was based on results of modeling simulations (as described below), current information including scientific literature, direct observation, project design reports, reasonable scientific judgment, the scoping process, and other environmental impact statement (EIS) documents for similar projects. The No Action Alternative considers the environmental conditions in the affected regions without the Proposed Action. However, the modeling analysis does include other planned restoration projects anticipated to be fully or partially in operation by 2015-2020 [C-43 West Reservoir, C-44 Reservoir and Stormwater Treatment Area (STA), Site 1 Impoundment, Broward Water Preserve Area (C-11 and C-9 Impoundments), C-111 Spreader Canal project, and the Loxahatchee River Watershed Restoration Plan].

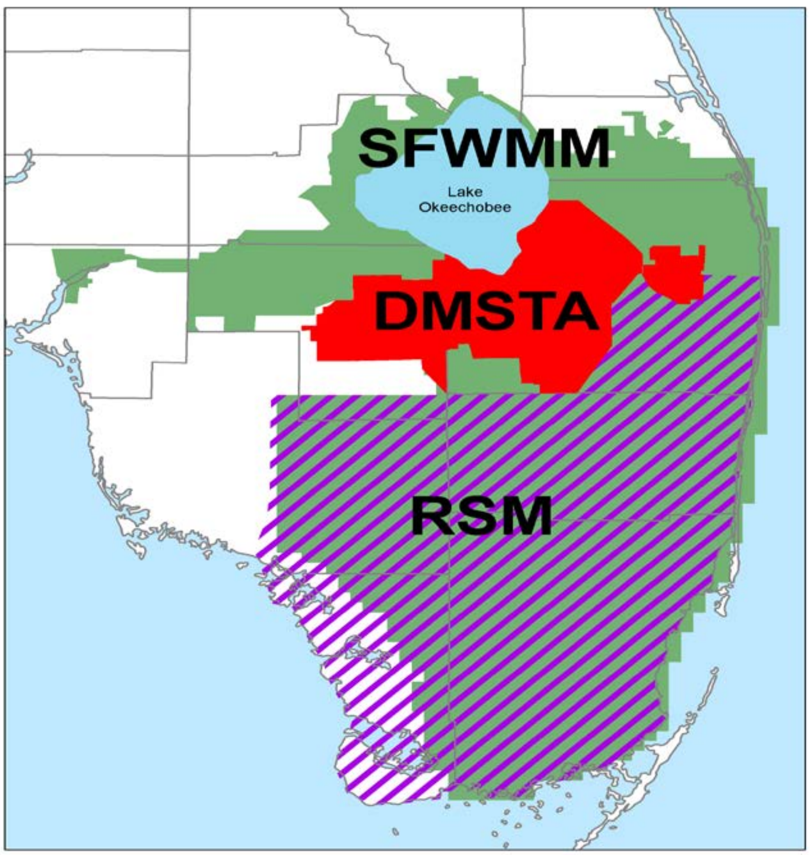
Environmental impacts include both direct and indirect effects. Under the Council on Environmental Quality (CEQ) regulations, direct effects are “caused by the action and occur at the same time and place,” while indirect effects are “caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems” (40 CFR 1508.8). Potential impacts of this project in concert with other reasonably foreseeable projects (cumulative effects) is discussed in Section 4.19, unavoidable adverse impacts, effects to the resources that cannot or would not be reversed in a foreseeable amount of time (irreversible and irretrievable commitment of resources), any conflicts and controversy associated with this project, and environmental commitments.

4.2 MODELING EFFORTS

The objective of the modeling efforts was to evaluate the effects on hydrology, water quality, and the downstream environment. The results of the modeling efforts that describe the overall water management is described in Section 4.5.1, surface water hydrology including surface ponding and hydroperiod in Section 4.5.2, groundwater in Section 4.5.3, and water quality in Section 4.6.

Three models were integrated into this EIS: 1) the South Florida Water Management Model [SFWMM or 2x2 (SFWMD, 2005)]; 2) the Dynamic Model for Stormwater Treatment Areas (DMSTA) Version 2 (Walker and Kadlec, 2005); and 3) the Regional Simulation Model (RSM) (SFWMD, 2005). See **Figure 4-1** for the approximate spatial extent of each of the three models used in this EIS. The Model Documentation Reports for SFWMM, DMSTA and RSM describe the methods and assumptions in detail and are provided in Appendix E. Performance measure graphics for the alternatives are provided within Section 4. These three models represent the best available tools for simulating hydrology and water quality. Each model has been developed specifically for the Everglades region, and has been developed and refined over a period of several years.

Figure 4-1 Approximate Model Domains



4.2.1 SOUTH FLORIDA WATER MANAGEMENT MODEL

The SFWMM (or 2x2) is a regional, hydrologic computer model specifically developed and applied to simulate the unique hydrology of the south Florida system and its regional management. Use of the SFWMM in this EIS involved application of the model to estimate the volume and timing of surface water flows discharged from source basins contributing inflows to existing STAs and proposed project features associated with the alternatives described below, with eventual discharge into the Everglades Protection Area (EPA).

The SFWMM is a coupled surface water-groundwater model which incorporates overland flow, canal routing, unsaturated zone accounting and two-dimensional single layer aquifer flow. The model simulates the major components of the hydrologic cycle in south Florida including rainfall, evapotranspiration, infiltration, overland and groundwater flow, canal flow, canal groundwater seepage, levee seepage and groundwater pumping. The model has been exclusively developed for the south Florida region and has been calibrated and verified using water level and discharge measurements at hundreds of locations distributed throughout the region within the model boundaries. In addition to simulating the natural hydrology in south Florida, the model also simulates the management processes that satisfy policy-based rules to meet flood control, water supply and environmental needs. It can incorporate current or proposed water management control structures and current or proposed operational rules. The SFWMM simulates hydrology on a daily basis using climatic data for the 1965-2005 period of record which includes many droughts and wet periods.

The SFWMM simulation RS_BASE2 used in this EIS provided the modeled hydrologic estimates for inclusion in the DMSTA water quality modeling effort described below. The intent of the SFWMM simulation RS_BASE2 is to represent a projection of the south Florida system hydrology as it would be in the future condition (circa 2015-2020). This projection is dependent on several assumptions, including anticipated completion of current and planned projects, system operating protocols and projections of future consumptive use and environmental demands. Although the entire south Florida regional system is modeled by the SFWMM, the modeling results for this EIS focused on the basin hydrology in and in the vicinity of the Everglades Agricultural Area (EAA) specifically related to basins that contribute flow to Everglades STAs that discharge into the EPA. The period of simulation (or selected period of record) of RS_BASE2 is January 1, 1965 to December 31, 2005. For the purposes of this EIS, SFWMM simulation RS_BASE2 provides hydrologic estimates of the areas identified in **Figure 4-1**. A detailed description of the south Florida system-wide assumptions and projects that were incorporated into the RS_BASE2 scenario is provided in the SFWMM Model Documentation Report provided in detail in Appendix E.

For each basin, daily flow time series were provided from the SFWMM output. These daily flow time series provide the basis for the generation of inputs to the DMSTA model. The SFWMM daily flows were post-processed using methods that are consistent with previous DMSTA modeling efforts (Gary Goforth, Inc., 2009). Essentially, SFWMM post-processing requires the merging of historical phosphorus concentration data from contributing source basins with the

SFWMM daily flows to generate inflow datasets for DMSTA. During this process, some aspects of the SFWMM-estimated hydrology are recalculated or rescaled to more closely approximate observed historical data. Specific post-processing details are provided in the Model Documentation Report provided in Appendix E.

For this EIS, the inflow datasets for DMSTA that were prepared by post-processing SFWMM daily flows were utilized for all EIS alternatives. Any changes as a result of alternative project features and their operations were formulated and evaluated as part of the DMSTA water quality modeling effort. To be clear, SFWMM was not utilized to formulate or evaluate alternatives; this was accomplished by the DMSTA and RSM modeling efforts described below. As a planning tool, the SFWMM was applied to estimate regional-scale hydrologic responses to proposed modifications to the water management system in south Florida. Results from the regional scale investigation were then used for more detailed modeling and investigation at a sub-regional scale, which in turn provided the bases for detailed evaluation of specific alternatives. Therefore, SFWMM results are equivalent for all EIS alternatives.

4.2.2 DYNAMIC MODEL FOR STORMWATER TREATMENT AREAS

The DMSTA was used to simulate EAA surface water routing, and estimate the phosphorus removal performance of the STAs and Flow Equalization Basins (FEBs) in the alternatives. DMSTA was developed for the United States Department of the Interior (DOI) and the U.S. Army Corps of Engineers (USACE) (Walker and Kadlec, 2005; http://wwwalker.net/dmsta/). DMSTA was developed and calibrated to information specific to south Florida and to predict phosphorus removal performance of Everglades STAs and storage reservoirs, and has been commonly used since 2001 by state and federal agencies for STA design and evaluation. The 2005 version of DMSTA was calibrated to data from 35 fully functional STA treatment cells with vegetation communities of various types. The model provides detailed output on the water and phosphorus balances of individual treatment cells and entire STAs, regional networks of STAs and storage reservoirs.

Model input requirements include daily values for flow, phosphorus concentration, rainfall, evapotranspiration (ET), depth (optional input or simulated value) and releases (optional input or simulated), treatment area configuration, cell size, flow path width, vegetation type, estimates of hydraulic mixing, outflow hydraulics, and seepage estimates. Phosphorus removal rates (settling rates) and other phosphorus cycling parameters can be either user-defined or calculated within DMSTA based on calibration data sets. DMSTA assumes that specified vegetation types (emergent, submerged, periphyton) will be maintained over the 40-year hydrologic period used as a basis for design, with some allowance for down time required for maintenance.

Some level of forecast error may result when applying any model, reflecting the limitations of the calibration datasets (data range, measurement error, short duration, etc.). One limitation of DMSTA is that the model may not reproduce phosphorus loading spikes observed in some STA cells following periods of extended dry-out. Careful management of treatment cell water depths and operating the STA in conjunction with an FEB may be two options to minimize the frequency and duration of such conditions. DMSTA may forecast outflow concentrations below values observed in the field following extreme drought conditions if management measures are unsuccessful at maintaining sufficient water levels. To ensure a conservative analysis, annual values less than 12 parts per billion (ppb) simulated by DMSTA were replaced with a value of 12 ppb in both this EIS and the Restoration Strategies Regional Water Quality Plan.

DMSTA is the best available tool for simulating phosphorus removal performance of existing or planned storage reservoirs and STAs. DMSTA is configured to allow integration with the SFWMD's regional hydrologic models, such as the SFWMM (SFWMD, 2005) and can be configured to simulate complex regional networks of STAs and reservoirs. DMSTA's spreadsheet interface and relatively limited input data requirements allow the development and evaluation of various alternatives (Walker and Kadlec, 2011). For this EIS, DMSTA results are summarized for the water years (Water Years 1965 – 2005 or May 1, 1965 – April 30, 2005) that are contained with the SFWMM period simulation (January 1, 1965 – December 31, 2005), which is used as input for the RSM.

DMSTA Results

The phosphorus removal performance of Alternatives 1, 2, 3, and 4 was projected using DMSTA. DMSTA provides simulated inflow and outflow volumes, and total phosphorus concentrations and loads for the FEBs and STAs. DMSTA also provides water depths within the project area and the FEBs and STAs. These results were used, in part, to determine effects on water resources, vegetation, fish and wildlife, and threatened and endangered species in the project site, and in STA 2, and STA 3/4. However, DMSTA results alone are not sufficient for evaluating environmental effects within Water Conservation Area (WCA) 2A, WCA 3A and Holey Land Wildlife Management Area (Holey Land). Therefore, DMSTA-simulated daily flows were provided as boundary flows to Glades and Lower East Coast Service Area (LECSA) RSM for further analysis in order to understand effects of the alternatives on areas downstream of the STAs. In some areas, DMSTA flows were combined with SFWMM flows (not simulated within DMSTA) and provided as input to the Glades LECSA RSM. See the DMSTA modeling report provided in Appendix E for more information.

4.2.3 REGIONAL SIMULATION MODEL

The Glades and LECSA RSM model (also referred to as the Glades-LECSA model) is an application of the RSM developed by the SFWMD. RSM was used to project the hydrologic conditions downstream of the STAs. The Glades-LECSA model represents the most recent generation of integrated surface and groundwater flow models developed specifically to address the complexity of south Florida’s hydrologic system. The model also has capabilities to predict the outcomes of implementing structural and operational changes to the water management system in south Florida. The Glades-LECSA model domain includes all WCAs, Everglades National Park, Big Cypress National Preserve and the Lower East Coast Service Areas south of the C-51 Canal in Palm Beach County. The Glades-LECSA model was used in this EIS to evaluate the hydrologic impacts of the EIS alternatives within the affected environment.

The RSM is an implicit, finite volume, continuous, distributed and integrated surface-water and groundwater model. It simulates the one-dimensional canal/stream flow and two-dimensional overland and groundwater flow in arbitrarily shaped areas using a variable triangular mesh. The overland and groundwater flow components are fully coupled for a more realistic representation of the hydrology in south Florida. It has physically based formulations for the hydrologic processes which include evapotranspiration, infiltration, levee seepage, and canal and structure flows. The model uses the diffusive wave approximation of Saint-Venant’s equation to simulate canal and overland flows. The Manning’s equation is used to simulate overland flow. The Glades-LECSA model mesh consists of 5,794 triangular cells with an average cell size of approximately one square mile. The domain takes into consideration the need for having higher spatial resolution in areas where steep hydraulic gradients and prominent physical features (e.g., levees) exist. The mesh resolution is the finest in the natural areas, especially WCA 3B, which has the smallest average cell area (0.41 square miles) and finest resolution. The mesh is designed to conform to all important flow controlling features, such as roads and levees within the model domain. A one-day time step was used for the calibration and validation of the model. The model has been stringently calibrated with goodness of fit (for bias and root mean squared error) comparable to the SFWMM. The model results show that the Glades-LECSA model is capable of simulating, with an acceptable error tolerance, the stage and other stage dependent variables such as flow, flow vectors, ponding depth and hydroperiods within the model domain.

The Glades-LECSA model used as a baseline in this EIS reflects the south Florida system hydrology as it would be in the future condition without any of the EIS alternatives, or in the No Action Alternative. It is comparable to the SFWMM model (described above) in that it includes projects and operations circa 2015-2020. It also includes the recently implemented Everglades Restoration Transition Plan (ERTP) schedule in WCA 3A. The period of simulation of the Glades-LECSA model is January 1, 1965 to December 31, 2005. For simulation of the EIS alternatives, the Glades-LECSA model boundary conditions at the northern model boundary are a combination of output from the SFWMM and DMSTA for each of the four alternatives. In other words, outflows from the EIS alternatives, as simulated by DMSTA, are combined with relevant SFWMM boundary conditions (not simulated by DMSTA) and provided as input to the Glades-LECSA model.

Glades LECSA RSM Results

Glades LECSA RSM simulates daily components of the hydrologic cycle (canal and structure flows, infiltration, levee seepage, evapotranspiration, etc.) resulting from daily precipitation and climate variables for the period of January 1, 1965 to December 31, 2005. Using Glades LECSA RSM, the influence of implementing the Action Alternatives and their resultant infrastructure changes and water management practices on the region's water resources can be evaluated over a 41-year period of meteorological conditions (1965-2005). The Glades LECSA RSM simulation used a baseline for this EIS represents the south Florida system hydrology as it would be in the 2015-2020 condition without any of the EIS alternatives.

Performance measure graphics are outputs of Glades LECSA RSM and were utilized for this EIS to assist in the evaluation of the effects of the EIS alternatives on WCA 2A and WCA 3A. These graphics identify the potential downstream effects to surface water hydrology, which in turn were considered in the evaluation of effects to soil; geology; water supply; surface water management; water quality; vegetation; and threatened and endangered species; fish and wildlife. See the RSM modeling results provided in Appendix E for more information.

4.2.4 KEY MODELING ASSUMPTIONS

A detailed description of the south Florida system-wide assumptions and projects that were incorporated into the modeling analysis is provided in Appendix D. A summary is outlined below:

- LORS2008 Lake Okeechobee Regulation Schedule
- Full Everglades Construction Project Build-out (STAs 1-6 with Comp. B and C; total effective area = 57,000 acres)
- CERP Projects: 1st and 2nd generation projects assumed (C-43 West Reservoir & C-44 Reservoir and STA, Site 1 Impoundment, Broward Water Preserve Area(C-11 and C-9

Impoundments), C-111 Spreader Canal Project) and the Loxahatchee River Watershed Restoration Plan

- WCA-1, 2A & 2B: Current C&SF Regulation Schedules
- WCA-3A & 3B: ERTP regulation schedule for WCA-3A, as per SFWMM modeled alternative 9E1
- Everglades National Park (ENP): Water deliveries to ENP are based upon ERTP, with the WCA-3A Regulation Schedule including the lowered Zone A (compared to IOP) and extended Zones D and E1. The one mile Tamiami Trail Bridge as per the 2008 Tamiami Trail Limited Reevaluation Report is modeled as a one mile weir, located east of the L67 extension and west of the S334 structure.
- Source Basin Total Phosphorus Concentration Period of Record: Water Years 2000-2009
- Total Phosphorus Concentrations for Lake Okeechobee releases conveyed to the STAs are based on water quality measurements collected at Lake outlets
- STA Duty Cycle Factor: 0.95 (i.e. STAs assumed to be offline for an average of 1 year out of 20 years for potential time needed for major maintenance or rehabilitation activities)
- Extreme Event Diversions: Inflows above STA structure capacities and when STA water depths are above 4 feet are sent directly to WCAs
- Urban Water Supply Deliveries from Lake Okeechobee not conveyed to STAs for treatment

4.3 LAND USE

Pursuant to grant agreement FB-4 entitled *Cooperative Agreement Among the United States Department of the Interior and the Nature Conservancy and The South Florida Water Management District* (Cooperative Agreement), lands acquired for public ownership under the Cooperative Agreement, including the A-1 project site will be used and managed for purposes of restoration in the Everglades ecosystem . Any proposed change in land use of Compartment A-1 may not be implemented until the U.S. Fish and Wildlife Service (USFWS)/DOI: 1) reviews the proposal; 2) determines that it meets the requirements of the National Environmental Policy Act (NEPA), Section 7 of the Endangered Species Act (ESA), Section 106 of the National Historic Preservation Act, and any other applicable statutes; and 3) approves the proposal. The Cooperative Agreement also includes a provision for dispute resolution. The USFWS/DOI approved an interim land use change for the A-1 project site on July 12, 2006, for utilization of the site as the A-1 Reservoir.

4.3.1 NO ACTION ALTERNATIVE

If the site were to remain fallow or return to agricultural use, it would no longer be used for restoration purposes pursuant to the Farm Bill and the Cooperative Agreement. Therefore, any proposed land use of the site would need to be evaluated by the USFWS/DOI pursuant to the terms of the Cooperative Agreement. The land uses for STAs 2 and 3/4 would not change. The STAs would continue to be utilized for water quality purposes, and they would continue to support ancillary recreational uses such as hunting, fishing, and wildlife viewing. The land uses in WCA 2A, WCA 3A, and the Holey Land also would not change. WCA 2A and WCA 3A would continue to store flood waters for beneficial municipal, urban, and agricultural uses and would continue to provide flood protection, water supply storage, and environmental resource protection while Holey Land would continue to provide environmental resource protection.

4.3.2 ACTION ALTERNATIVES

4.3.2.1 Project site

Alternatives 2, 3, and 4 would utilize the A-1 site in combination with STA 2 and STA 3/4 to ensure that water leaving the STA discharge points meets the WQBEL prior to discharge into the EPA. Each of the Action Alternatives would only accept existing water from Lake Okeechobee. Unlike the previous A-1 Reservoir project, the Shallow FEB, Deep FEB, and the STA are designed to store water from Lake Okeechobee that is currently budgeted to be discharged south. The change in the purpose of the projects would require the lands to be used for water quality purposes rather than water storage purposes. Therefore, each of the Action Alternatives would require approval for a land use change from the USFWS/DOI.

4.3.2.2 Stormwater Treatment Areas

Under the Action Alternatives, the land use for STA 2 (including Compartment B) and STA 3/4 would not change. Operations of the STAs would continue in order to provide water quality improvement in discharges to the EPA. Land use would continue to be classified as public/institutional or conservation and would continue to support ancillary recreational uses such as hunting, fishing, and wildlife viewing.

4.3.2.3 WCAs and Holey Land

Under the Action Alternatives, there would be no changes in the land uses for WCA 2A, WCA 3A, and the Holey Land.

4.4 GEOLOGY, TOPOGRAPHY AND SOILS

4.4.1 GEOLOGY AND TOPOGRAPHY

4.4.1.1 No Action Alternative

Under the No Action Alternative, surficial geology of the project site, the STAs, the WCAs, or Holey Land is not anticipated to change. The project area would likely remain undisturbed or be converted back to active agriculture. In the future, soils are expected to continue to subside within the project area due to oxidation and lack of new sediment deposition within the project area. As soil subsides, the topography is expected to lower slightly. No changes to topography are expected for the STAs, the WCAs, or Holey Land under the No Action Alternative since the land use and surface water operations within these areas are not expected to change.

4.4.1.2 Action Alternatives

With all the action alternatives, there would be minor geologic impacts within the project area from the removal of surface cover (e.g. vegetation and soil), of the caprock from blasting, and removal of limestone to obtain material for construction of levees, canals and roads. The depth of the caprock varies from less than 1 to 4 feet; and averages a depth of approximately 2 feet across the project site. Seepage and borrow canals would be constructed with all three of the Action Alternatives and portions of existing canals and ditches would require fill to provide elevations consistent with the adjacent wetlands for Alternatives 2 (Shallow FEB) and 3 (Deep FEB).

Alternatives 2 and 4 would result in conversion of relatively flat, uniform agricultural lands to an FEB or STA with shallow water (4 feet maximum operating depth) and exterior levees up to 10 feet above existing grade (generally 7 to 9 feet North American Vertical Datum 1988). Alternative 2 (Shallow FEB) would require internal levees to be constructed to enable the conveyance of flows to the north end of the project site. Alternative 4 (STA) would also require additional internal levees to be constructed to delineate STA treatment cells and flow-paths.

Alternative 3 is an FEB with deep water (12.5 feet maximum operating depth) and exterior levees up to 25 feet above existing grade. For Alternative 3 (Deep FEB), additional blasting or fracturing of the caprock would be required both to construct the higher levee walls and to construct an associated pump station. The seepage buffer on the east, west, and north of the project site would have a 150-foot wide strip at existing grade.

No changes to geology or topography are expected are expected within the STAs, the WCAs, or Holey Land through implementation of any of the action alternatives as additional features, land use, and operations are not expected to change.

4.4.2 SOILS

4.4.2.1 No Action

Under the No Action Alternative it is expected that the project site would remain fallow or return to agriculture. Currently, direct rainfall is the dominant source of water for the project site. Under the No Action Alternative, dryout conditions and the resultant loss of soil due to oxidation would persist and possibly increase in frequency dependent upon future climatic conditions. With re-wetting, the oxidized soil releases phosphorus and other nutrients into the overlying water column thereby increasing the nutrient concentrations in runoff from the site. In addition to impacts on nutrient concentrations, it is expected that the continued loss of soil due to oxidation during dry conditions will result in a slightly lower topography in the project site in the future.

Under the No Action Alternative, STAs 2 and 3/4 will continue to face substantial management challenges caused by regional hydrologic conditions. As discussed in previous chapters, insufficient rainfall during the dry season can cause extreme low water conditions that expose wetland soils and result in the oxidation of organic material and the release nutrients. These conditions hinder the treatment performance of the STAs and threaten to delay or prevent the attainment of the Water Quality Based Effluent Limit (WQBEL).

If STA discharges exceed the WQBEL as projected under the No Action Alternative, the excess phosphorus discharged downstream will increase soil phosphorus concentrations in the WCAs. The current pattern of soil phosphorus enrichment near the major inflow points would remain and the gradient of elevated nutrient levels would continue to expand over time into the interior of the marsh. Soil characterization studies of the phosphorus gradient in WCA 2A have shown a roughly proportional increase in concentration of phosphorus near the major surface water inflow points concentrations at the major inflow points to the WCAs (DeBusk et al, 2001).

Under the No Action Alternative, there would be no affect to soils in the Holey Land.

4.4.2.2 Action Alternatives

During construction of levees, the muck soils would be removed and stockpiled on site to access the limestone. Following construction of the interior and exterior levees, excess muck would be redistributed over the previously scraped areas and in limited areas, back-sloped against the exterior face of the eastern and western interior levees. Alternatives 2 and 4 are expected to encourage vegetation establishment and wetland ecological function due to the shallow nature of the water levels. Muck soils would likely increase as a layer of fine sediments containing a high level of organic debris and nutrients would likely settle from the overlying water and cover the bottom. The soils within the project site are anticipated to remain hydric and retain muck properties or revert to muck properties post-construction. Alternative 3, the Deep FEB, is expected to contain less organic debris and nutrients since rooted vegetation would not be present.

The FEBs proposed in Alternatives 2 and 3 have the potential to benefit soils within STA 2 and STA 3/4 by maintaining minimum water levels and reducing the frequency of dryout conditions. Decreasing the frequency of dryout conditions will reduce the potential for soil oxidation and the resulting release of phosphorus and other nutrients from the soil. The probability of experiencing dryout conditions in STA 2 and STA 3/4 is greater under Alternative 4 (STA), as it would not operate to maintain the minimum water levels in the STAs.

Lower phosphorus concentrations coming from the STA 2 and STA 3/4 would reduce the rate of soil phosphorus accumulation in WCA soils. Over time, reductions in soil total phosphorus (TP) will help facilitate the restoration of impacted areas near the inflow points to WCA 2A and WCA 3A creating conditions more conducive to historic Everglades vegetative communities. The overall soil classification (histosol) and structure (muck) is not expected to change.

Alternatives 2 and 3 (FEBs) would have no effect on the soils in the Holey Land. Alternative 4 would require the construction of a discharge canal from the proposed STA to the L-5 Canal, which would disturb soils on the eastern portion of Holey Land adjacent to Cells 3A and 3B within STA 3/4. The remaining soils within Holey Land would remain undisturbed.

4.5 HYDROLOGY

4.5.1 OVERALL WATER MANAGEMENT

4.5.1.1 No Action

If agricultural activities were to resume on the A-1 project site, water would continue to enter the site via the Miami Canal and the North New River Canal; however, drainage improvements would be necessary to pump water off the property in the North New River Canal. If the site were to remain undisturbed, there would be no change in the surface water management as the water would continue to flow from the existing agricultural ditches to the STA 3/4 seepage canal.

There should be no changes to the surface water management within the STAs, WCAs, or Holey Land under the No Action Alternative.

4.5.1.2 Action Alternatives

4.5.1.2.1 Alternative 2 (Shallow FEB)

The Shallow FEB will be operated in series with (upstream of) STA 2 and STA 3/4. Inflows would be conveyed to the Shallow FEB from the Miami Canal via the existing pump station G-372 and from the North New River Canal via existing pump station G-370. After inflows are conveyed to the north end of the Shallow FEB, the water would sheet flow from north to south. An internal collection canal would be constructed to assist in conveying water out of the Shallow FEB back to the North New River Canal when the water deliveries are needed. Two operable water control structures will be constructed to control FEB water levels and flows into and out of the FEB; one at the existing pump station G-370 at the North New River Canal and one east of the existing pump station G-372 within the west levee of the FEB to collect runoff from the Miami Canal. To send water to STA 3/4, operable water control structures may also be constructed to allow discharges to be conveyed via gravity directly to the STA 3/4 inflow canal. To send water to STA 2, water would be pumped from the North New River Canal by the G-434 and G-435 pump stations. As stated in Chapter 2, Section 2.4.2, the majority of the shallow FEB outflows (approximately 80%) would be directed to STA 3/4 for treatment while the remaining flows (approximately 20%) would be conveyed to STA 2 (including Compartment B). Thus, out of the approximately 834,000 acre-feet of water per year that flows south to STA 2 and STA 3/4, 667,200 acre-feet per year would be conveyed to STA 3/4 while 166,800 acre-feet per year would be conveyed to STA 2. No changes to the structural components of the water management systems would be required for water inflows into STA 2, STA 3/4, WCA 2A, WCA 3A, or Holey Land.

4.5.1.2.2 Alternative 3 (Deep FEB)

The Deep FEB is operated in series with (upstream of) STA 2 and STA 3/4. The Deep FEB would receive water from the Miami Canal via existing pump station G-372, and from the North New River Canal via existing pump station G-370 and the new inflow pump station. Outflows would be conveyed back to the North New River Canal when water deliveries are needed. Operable water control structures may also be constructed to allow FEB discharges to be conveyed via gravity directly to the STA 3/4 inflow canal. The majority of the Deep FEB outflows (approximately 60%) would be directed to STA 3/4 for treatment while the remaining flows (approximately 40%) would be conveyed to STA 2 (including Compartment B). Thus, out of the approximately 834,000 acre-feet of water per year that flows south to STA 2 and STA 3/4, 667,200 acre-feet per year would be conveyed to STA 3/4 while 166,800 acre-feet per year would be conveyed to STA 2. No changes to the structural components of the water management systems would be required for water inflows into STA 2, STA 3/4, WCA 2A, WCA 3A, or Holey Land.

4.5.1.2.3 Alternative 4 (STA)

The STA would operate in parallel with STA 2 and STA 3/4 (i.e. would provide additional STA acreage, but would not deliver water from this A-1 STA to STA 2 or STA 3/4). The proposed A-1 STA would utilize the existing STA 3/4 inflow pump stations (G-370 and G-372) to convey stormwater runoff to the proposed STA. Flows would be distributed to the STA cells [33% emerged aquatic vegetation (EAV) and 67% submerged aquatic vegetation (SAV)] via water control structures and conveyed north-to-south in internal collection canals. In order to operate the new STA, the STA discharge canal would need to be connected to the L-5 Canal, which would require the proposed discharge canal to be constructed within a small portion of the perimeter of the Holey Land. This would enable the delivery of discharges from the proposed A-1 STA to WCA 2A and/or WCA 3A via existing infrastructure, and would not alter the existing operations of STA 2, STA 3/4 and the North New River and Miami Canals. No changes to the structural components of the water management systems would be required for water inflows into STA 2, STA 3/4, WCA 2A, and WCA 3A.

4.5.2 SURFACE WATER HYDROLOGY

As described in Section 4.2, data obtained from the modeling efforts were used to estimate the volume and timing of surface water flows discharged from source basins contributing inflows to existing STAs and proposed project features associated with the Alternatives, with eventual discharge into the EPA. The source basins and their average annual flow volumes simulated by the SFWMM and post-processed as described above are provided in **Table 4-1**.

Table 4-1 Source Basin Volumes

Source Basins	Average Annual Flow Volume (acre-feet per year)
S-5A	44,500 [1]
S-2/S-6	181,400
S-2/S-7	263,900 [2]
S-3/S-8	218,400

East Shore Water Control District and 715 Farms (Closter Farms)	22,700
South Florida Conservancy District	19,100
South Shore Drainage District	11,700
C-139 (via C136)	14,700
Lake Okeechobee (Regulatory Releases)	58,300
Total	834,700

Notes: 1. Assumes runoff reduction resulting from the future 6,500-acre STA 1W expansion in the S-5A Basin.
2. S-7 runoff is reduced to 231,000 acre-feet per year for Action Alternatives due to runoff no longer occurring from the project site.

4.5.2.1 No Action

4.5.2.1.1 Project Site

Under the No Action Alternative, the surface water hydrology at the project site would likely remain rainfall driven if the area remains fallow. The wetlands would continue to experience seasonal ponding and the water levels in the ditches and canals would fluctuate depending on rainfall. During the rainy season, the scraped wetlands typically contain water depths between 6 and 12 inches of water while the scrub/shrub wetlands and exotic scrub/shrub wetlands typically contain water depths greater than 12 inches of water. During the dry season, no standing water is present. The canals are approximately 12 feet in depth while the canals are 6 feet in depth. Stormwater would continue to run off the lands into existing agricultural ditches and to the STA 3/4 seepage canal. If the project site was converted back to active agriculture, drainage improvements would likely be necessary to convey stormwater to the North New River Canal.

4.5.2.1.2 STA 2 and STA 3/4

Under the No Action Alternative, the surface water hydrology of STA 2 and STA 3/4 would continue to function as it does today and continue to operate under the existing operational plans. Agricultural and/or urban stormwater runoff primarily from the S-2, S-5A, S-6 and S-7 basins collected by the Hillsboro and North New River Canals would continue to be pumped directly into STA 2, while agricultural and/or urban stormwater runoff from the S-2, S-3, S-7, S-8 and C-139 basins collected by the North New River and Miami Canals would continue to be pumped directly into STA 3/4 for treatment. STA 2 and STA 3/4 would continue to receive peak stormwater flows and continue to experience dryout conditions that occur as a result of extreme hydrologic conditions that exist in south Florida. These conditions adversely impact the phosphorus removal performance of the STAs. Wet season conditions would likely continue to result in longer than optimal durations of greater than optimal water depths.

STA 2 and STA 3/4 are currently operated to encourage the growth and establishment of wetland plants within the STAs to optimize the uptake of phosphorus from stormwater passing through the cells. Maintaining minimum water stages improves the STA's phosphorus treatment performance by keeping the STAs hydrated and ensuring the viability of EAV and SAV, and regulating inflows to minimize high hydraulic loading rates. As stated in the Operations Plan dated December 2010 and August 2007 for STA 2 and STA 3/4, respectively, the treatment cells within the STA are recommended to be operated at target depths under normal operations:

- Minimum Depth: To the maximum extent practicable, a minimum static water level of 0.5 feet above the ground elevation should be maintained to avoid drying out the treatment cell, subject to available water from the upstream watershed.
- Maximum Depth: To the maximum extent practicable, a maximum static water level of 4.0 feet above the ground elevation should not be exceeded to avoid damage to the levees and marsh vegetation.

Table 4-2 provides the average annual inflow, diversion, and outflow volumes for STA 3/4 and STA 2 for the No Action Alternative. Out of the approximately 834,000 acre-feet of water per year that flows south to STA 2 and STA 3/4, 805,000 acre-feet of water per year enters STA 2 and STA 3/4 while 29,000 acre-feet per year from these basins and 27,000 acre-feet per year of Urban Water Supply are diverted around or bypass the STAs. Water diversions consist of the delivery of water to the WCAs without treatment by the STAs, usually during extreme storm events to maintain flood control. Conversely, urban water supplies are the deliveries of water to the canals passing through the WCAs without treatment by the STAs during dry periods, but delivered to the coast to maintain freshwater gradient in the coastal wells. **Figures 4-2 and 4-3** are ponding depth hydrographs based on DMSTA modeling for STA 2 and STA 3/4, respectively, for the No Action Alternative. **Figure 4-4** shows ponding depth duration curves for STA 2 and STA 3/4 for the No Action Alternative.

Table 4-2 STA 2 and STA 3/4 Inflow and Outflow Volumes, Diversions and Urban Water Supply

	Average Annual Volume (acre-feet per year)	
	Parameter	Alternative 1: No Action
STA 2	Inflow	301,000
	Diversion	17,000
	Outflow	307,000
	Outflow and Diversion	324,000
STA 3/4	Inflow	504,000
	Diversion	12,000
	Outflow	495,000
	Outflow and Diversion	507,000
STA 2 and STA 3/4	Inflow	805,000
	Diversion	29,000
	Outflow	802,000
	Outflow and Diversion	831,000[1]
	Urban Water Supply	27,000
	Outflow, Diversion and Urban Water Supply	858,000

[1]This value differs from Total Average Annual Flow Volume in Table 4-1 due to the DMSTA's dynamic simulation of rainfall, evaporation and seepage processes.

Figure 4-2 Ponding Depth Hydrograph for STA 2 – No Action Alternative

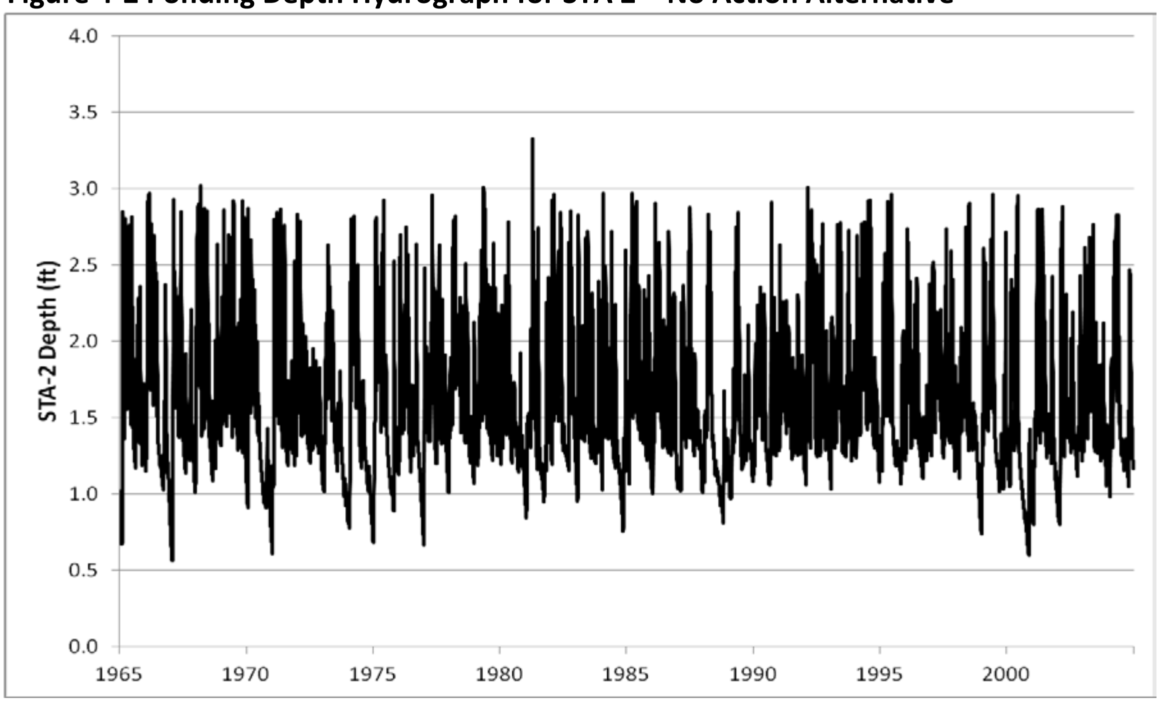


Figure 4-3 Ponding Depth Hydrograph for STA 3/4 – No Action Alternative

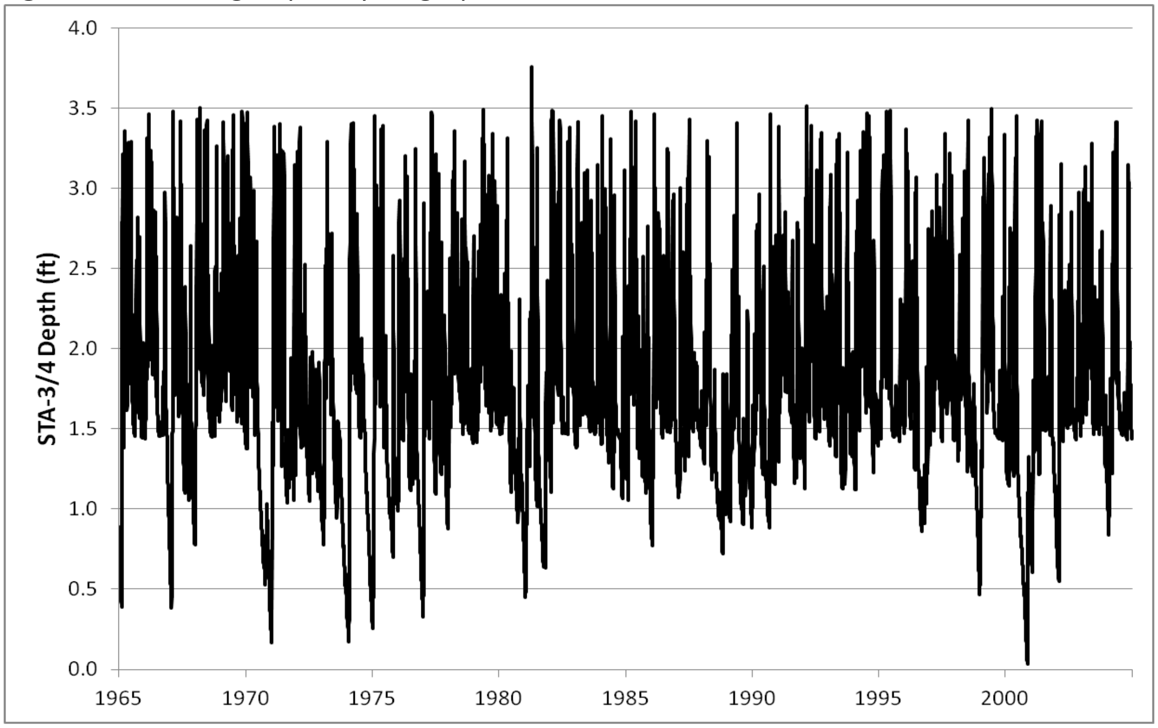
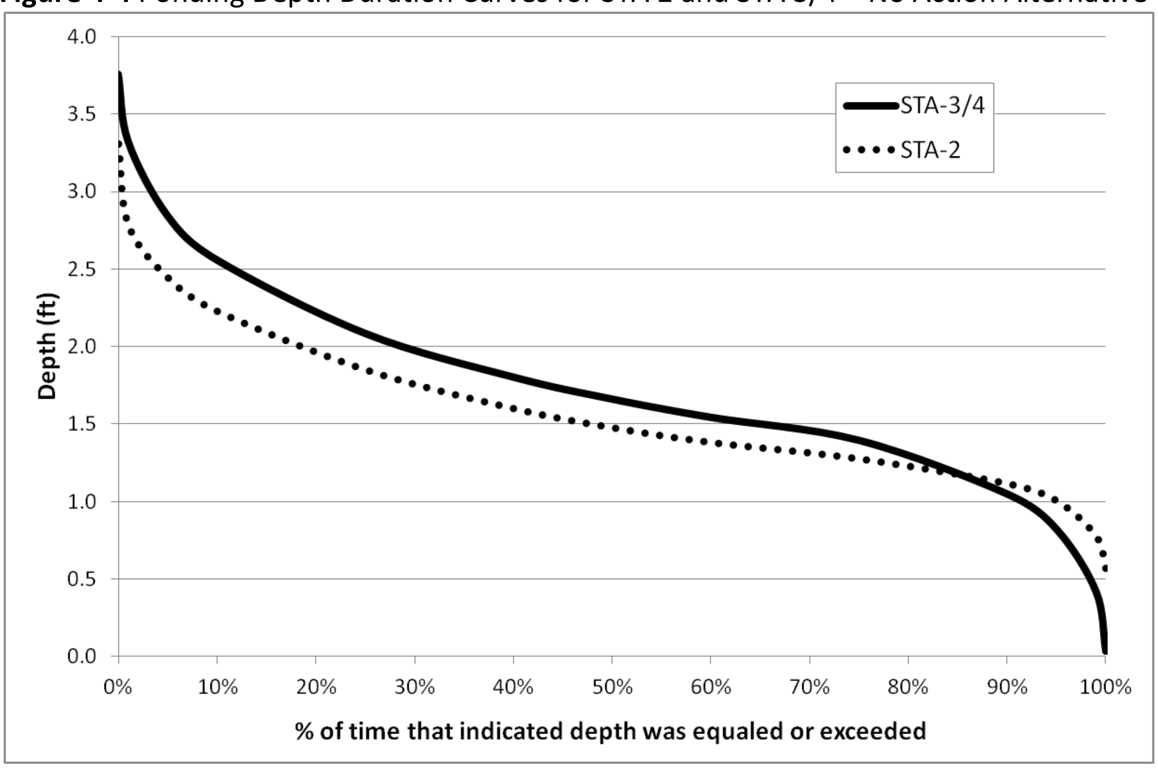


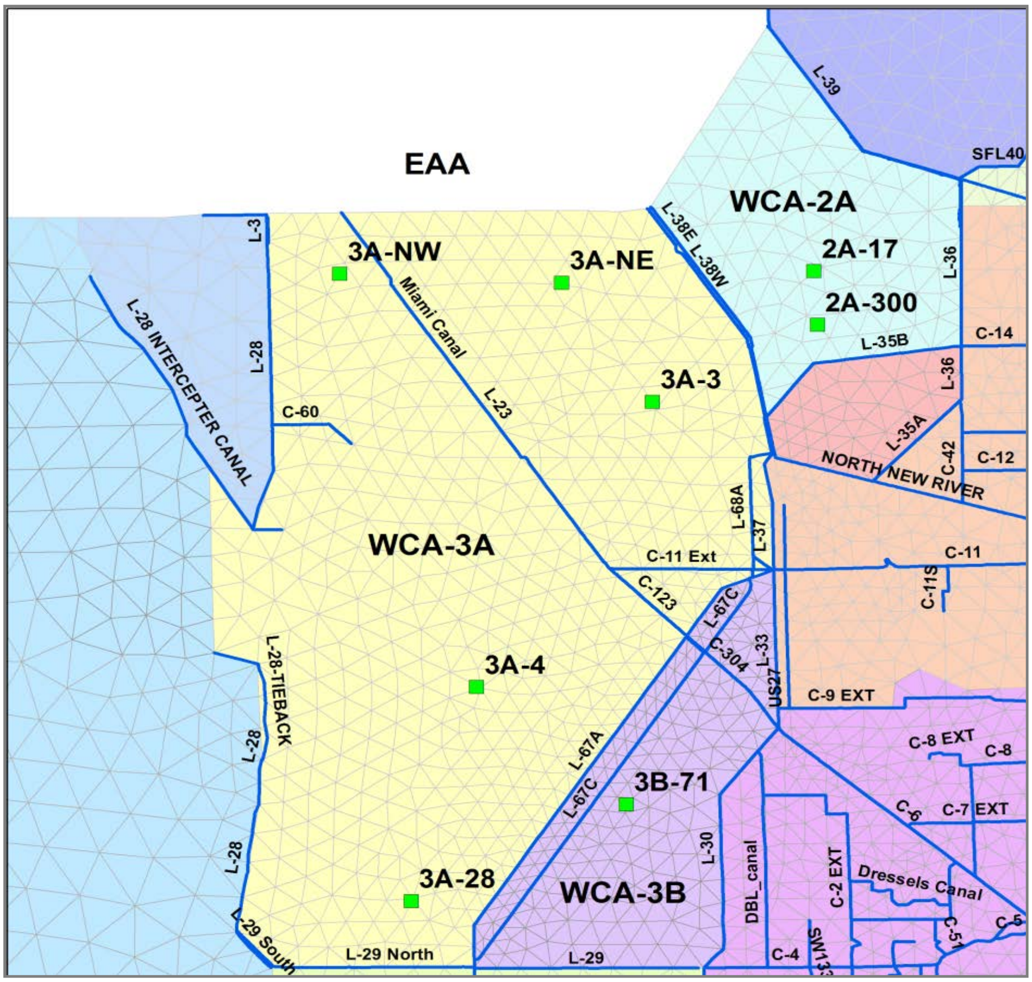
Figure 4-4 Ponding Depth Duration Curves for STA 2 and STA 3/4 – No Action Alternative



4.5.2.1.3 WCA 2A

Based on the results of the Glades LECSA RSM modeling, WCA 2A receives approximately 450,000 acre-feet per year via the L-6 Canal and the S-7 pump station. These WCA 2A inflows include treated flows from STA 2 and STA 3/4, STA 2 and STA 3/4 diversion flows and urban water supply flows. The amount of urban water supplies discharged from the WCAs is offset by the same volume of water from Lake Okeechobee. A gauge location map is provided in **Figure 4-5.**

Figure 4-5 WCA 2A and WCA 3A Gauge Location Map



The locations of two existing monitoring sites were chosen to depict the simulated changes in ponding depths within WCA 2A (2A-17 and 2A-300). Hydrographs of daily ponding depths (feet of surface water) and duration curves of ponding depths (plots of percentages of time that ponding depths equal or exceed specified values) are provided for the two WCA 2A gauge locations and changes in these hydrographs will be used to identify any potential effects of the Alternatives.

A ponding depth hydrograph and ponding depth duration curve for 2A-17 are provided in **Figures 4-6** and **4-7** for all Alternatives, respectively. Under the No Action Alternative, there are no changes to the ponding depths and water levels at this location within WCA 2A. Current ponding depths range between 3 feet above ground elevation and one foot below ground elevation at this gauge. Water levels are less than 2 feet above ground level 90 percent of the time. Ponding depth varies seasonally.

Figure 4-6 Ponding Depth Hydrograph for 2A-17 – All Alternatives

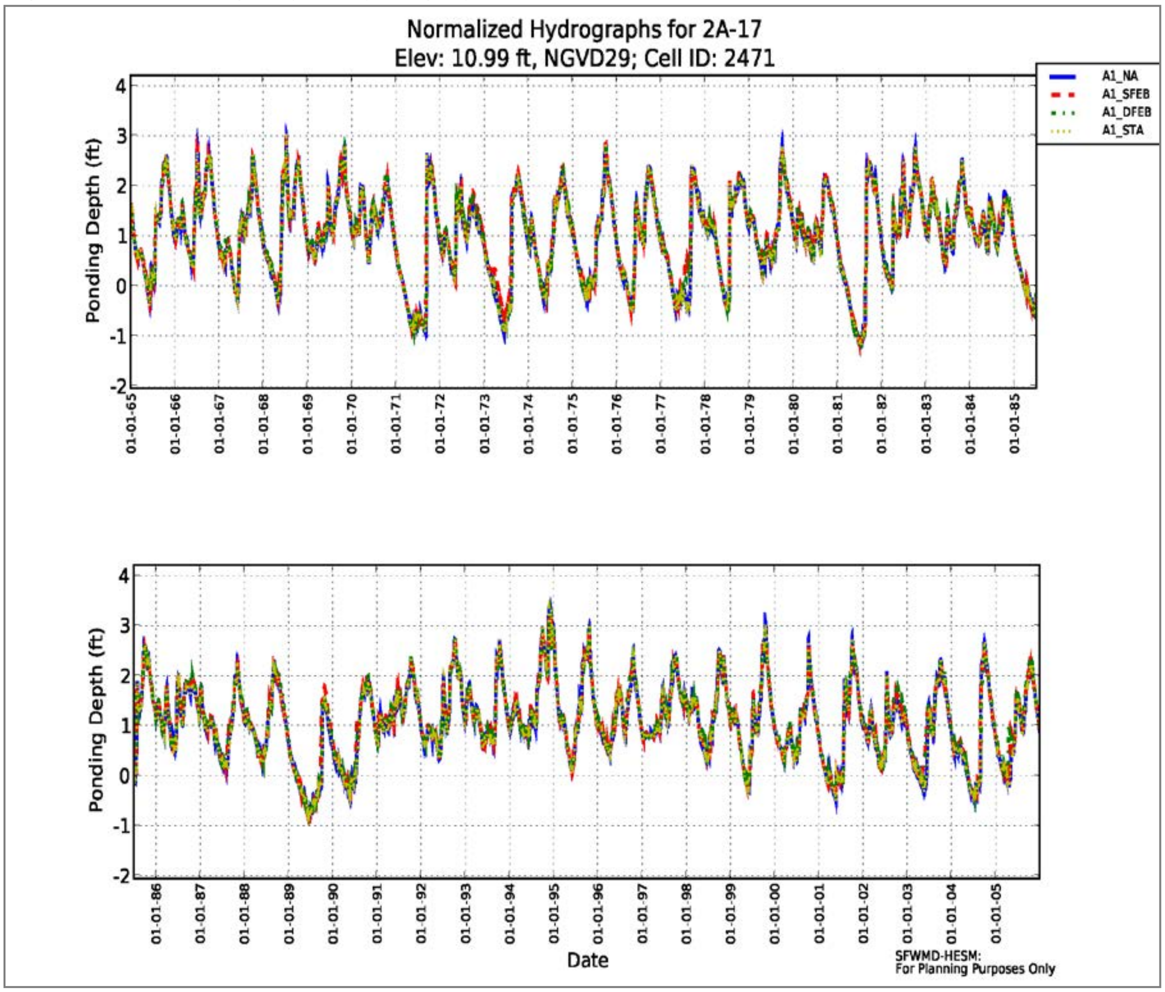
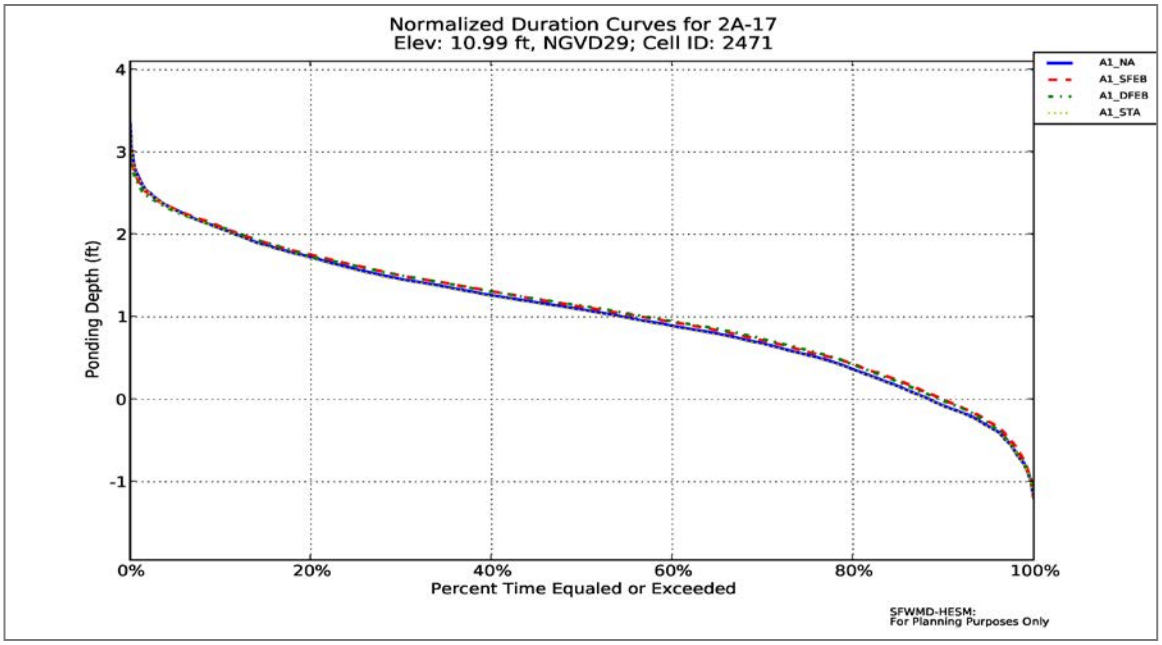


Figure 4-7 Ponding Depth Duration Curve for 2A-17 – All Alternatives



2A-300: A ponding depth hydrograph and ponding depth duration curve for 2A-300 are provided in **Figures 4-8** and **4-9** for all Alternatives, respectively. Under the No Action Alternative, there are no changes to the ponding depths and water levels at this location within WCA 2A. Current ponding depths range between 3.5 feet above ground elevation and 0.6 foot below ground elevation at gauge location 2A-300. Water levels are approximately between 0.3 feet to 2.8 feet above ground level 90 percent of the time. Ponding depth varies seasonally.

Figure 4-8 Ponding Depth Hydrograph for 2A-300 – All Alternatives

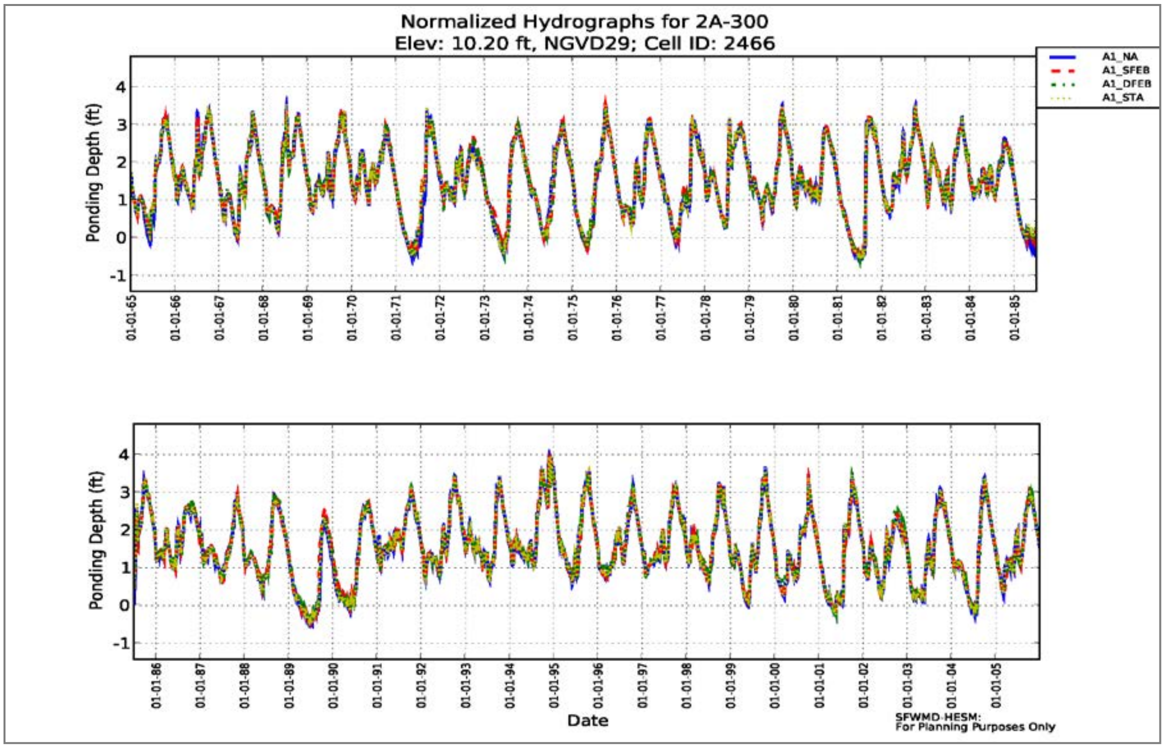


Figure 4-9 Ponding Depth Duration Curve for 2A-300 – All Alternatives

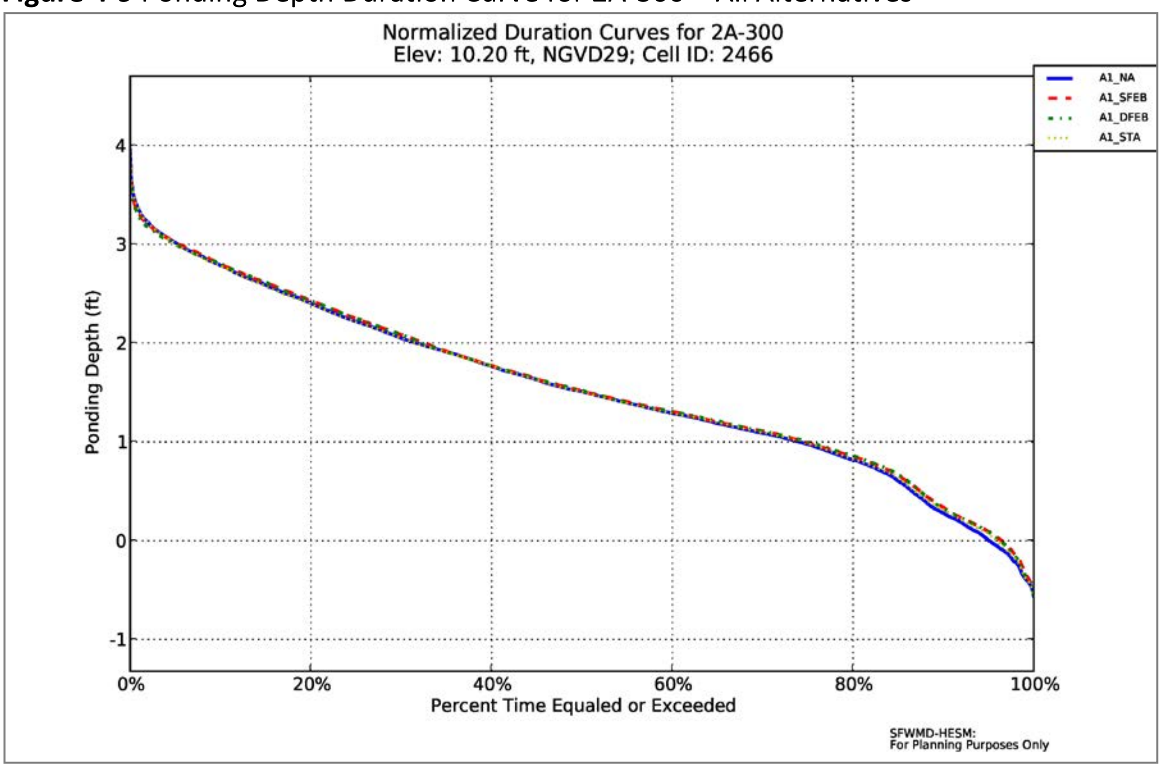


Figure 4-10 provides average annual ponding depths for WCA 2A and WCA 3A while **Figure 4-11** provides average annual hydroperiod distribution for WCA 2A and WCA 3A. The ponding depths and hydroperiod durations in WCA 2A and WCA 3A under the No Action Alternatives will be used to identify potential changes in the WCAs for Alternatives 2, 3, and 4.

In WCA 2A, the average annual ponding depths range from 0 feet to over 3 feet above the surface level. However, the majority of WCA 2A contains water depths between 0.5 feet and 2.0 feet. Three cells contain water depths between 0 feet and 0.5 feet above the surface, three cells contain water depths between 2 and 3 feet above the surface, while two cells in the southern portion contains water depths above 3 feet. In WCA 2A, the majority of the cells contain surface water between 300 and 365 days of the year. Eight cells contain standing water for 240-300 days out of the year, while one cell contains water above the surface for 120-180 days out of the year.

Figure 4-10 Average Annual Ponding Depth for WCA 2A and WCA 3A (No Action Alternative)

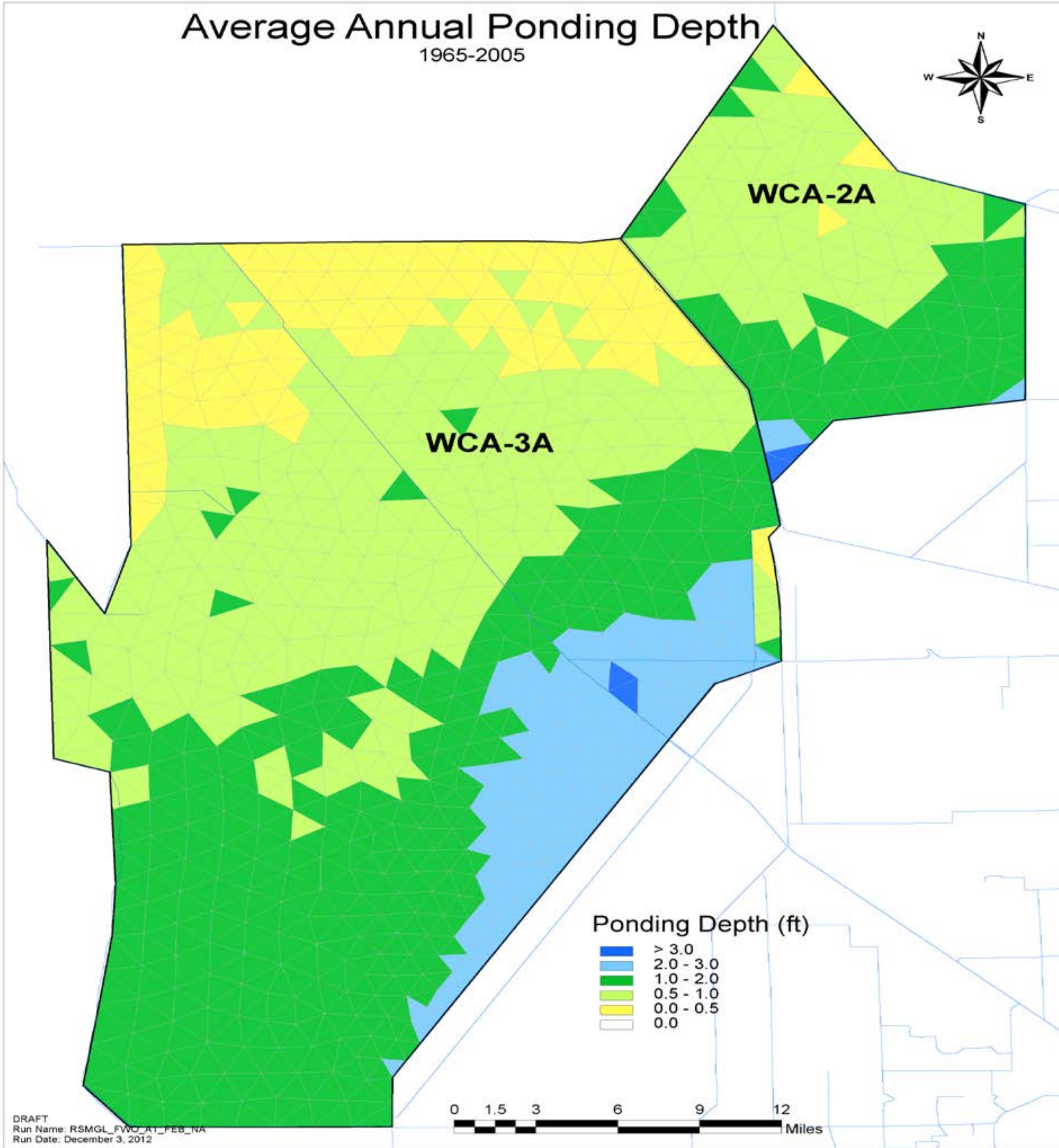
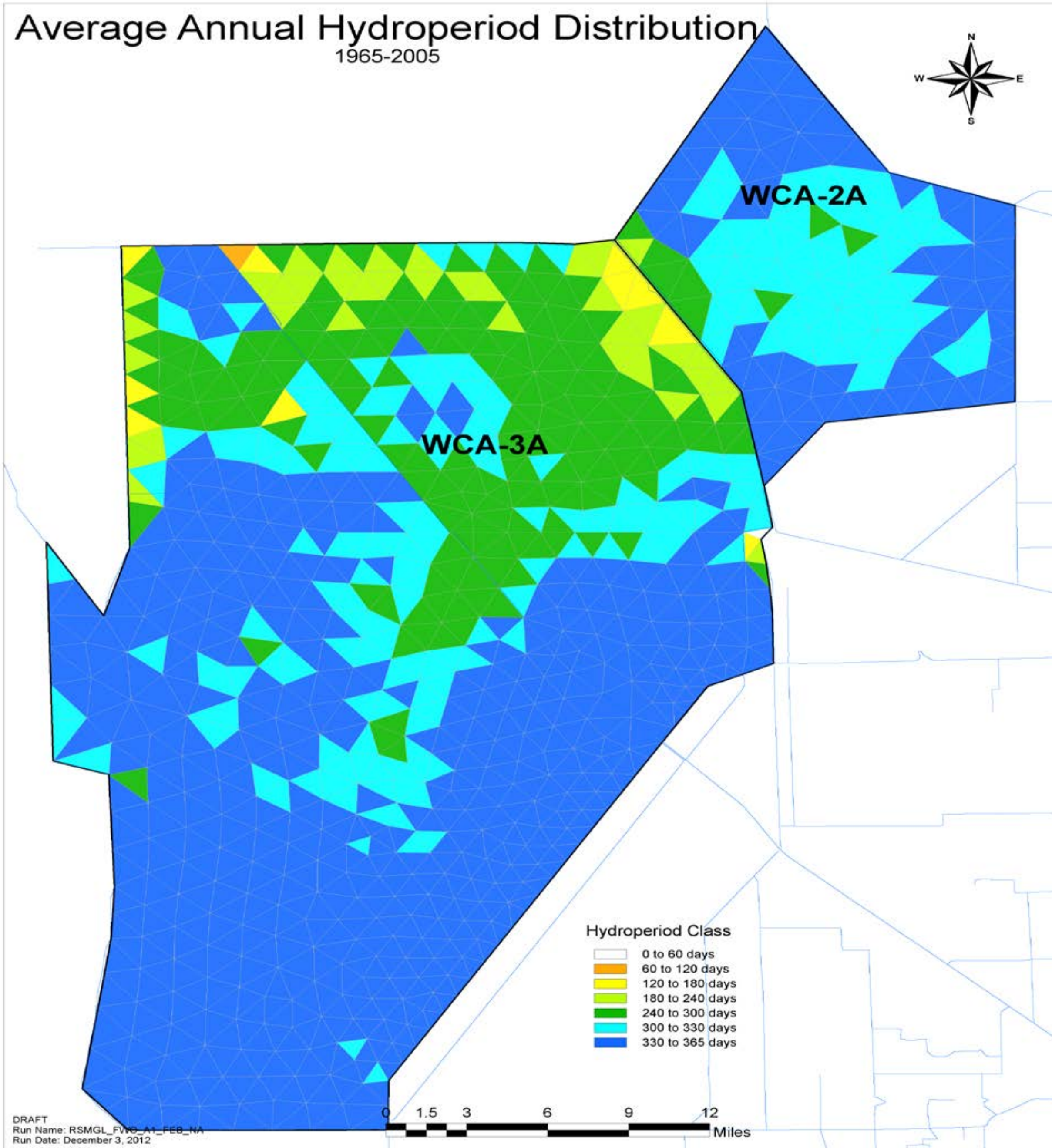


Figure 4-11 Average Annual Hydroperiod Distribution for WCA 2A and WCA 3A (No Action Alternative)



4.5.2.1.4 WCA 3A

Based on the results of the Glades LECSA RSM modeling, WCA 3A receives approximately 400,000 acre-feet per year via the S-150 structure and the S-8 pump station. These WCA 3A inflows include treated flows from STA 3/4, STA 3/4 diversion flows and urban water supply flows. Performance measure graphics were generated for several gauge locations within WCA 3A and for the entire area. A gauge location map is provided in **Figure 4-5**.

Five monitoring sites were chosen to depict the changes in ponding depths within WCA 3A (3A-NW, 3A-NE, 3A-3, 3A-4, and 3A-28). Hydrographs of daily ponding depths (feet of surface water) and duration curves of ponding depths (days of surface water inundation on average per year) are provided for the WCA gauge locations. Changes in these hydrographs will be used to identify any potential effects of the Alternatives in later sections (Section 4.5.2.2.4). Water levels in WCA 3A over the period of record simulated by RSM at each gauge location is described below.

3A-NW: A ponding depth hydrograph and ponding depth duration curve for 3A-NW are provided in **Figures 4-12** and **4-13,** respectively, for all Alternatives. Under the No Action Alternative, there are no changes to the ponding depths and water levels at this location within WCA 3A. Current ponding depths at this site range between -0.8 feet below ground elevation and 1.9 feet above ground elevation. Water levels are above ground elevation 90 percent of the time. Ponding depths vary seasonally.

Figure 4-12 Ponding Depth Hydrograph for 3A-NW – All Alternatives

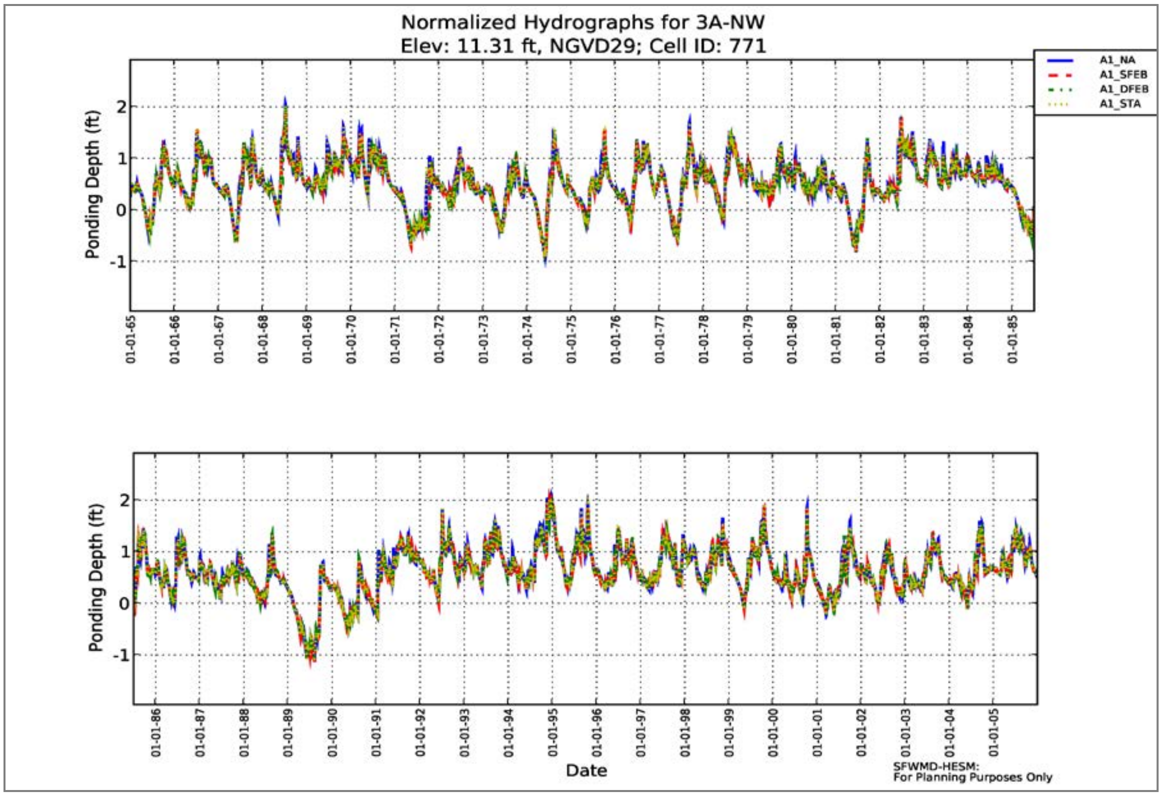
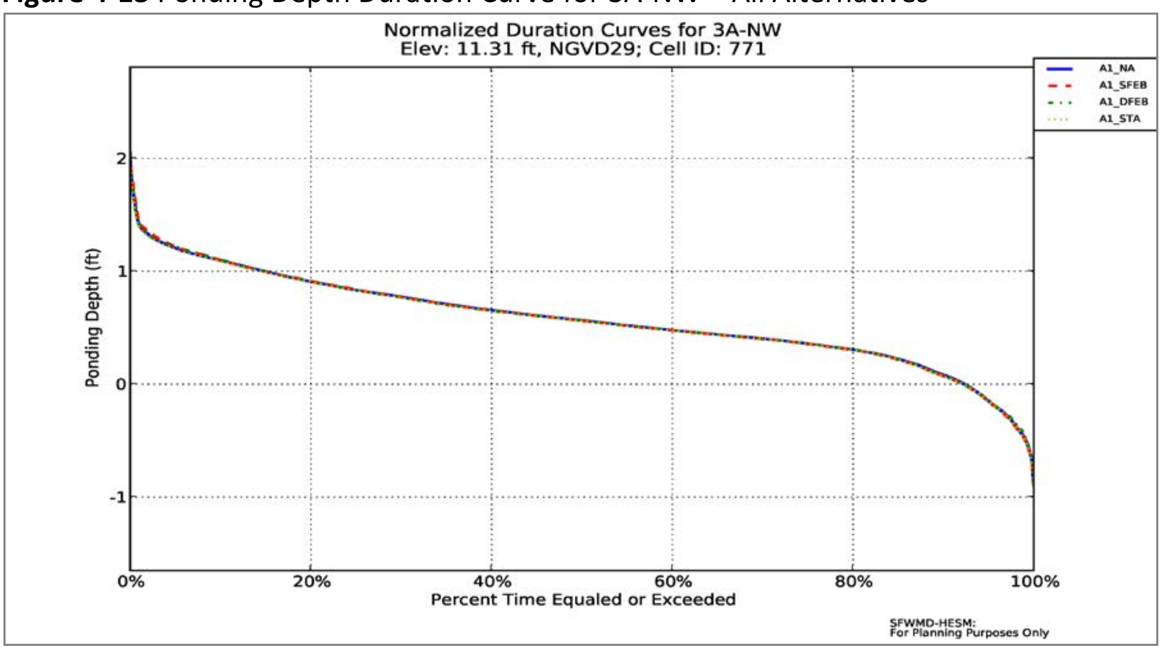


Figure 4-13 Ponding Depth Duration Curve for 3A-NW – All Alternatives



3A-NE: A ponding depth hydrograph and ponding depth duration curve for 3A-NE are provided in **Figures 4-14** and **4-15,** respectively, for all Alternatives. Under the No Action Alternative, there are no changes to the ponding depths and water levels at this location within WCA 3A. Ponding depths at this site range between -1.2 feet below ground elevation and 2.9 feet above ground elevation. Water levels are above ground elevations for 60% of the time. Ponding depths vary seasonally.

Figure 4-14 Ponding Depth Hydrograph for 3A-NE – All Alternatives

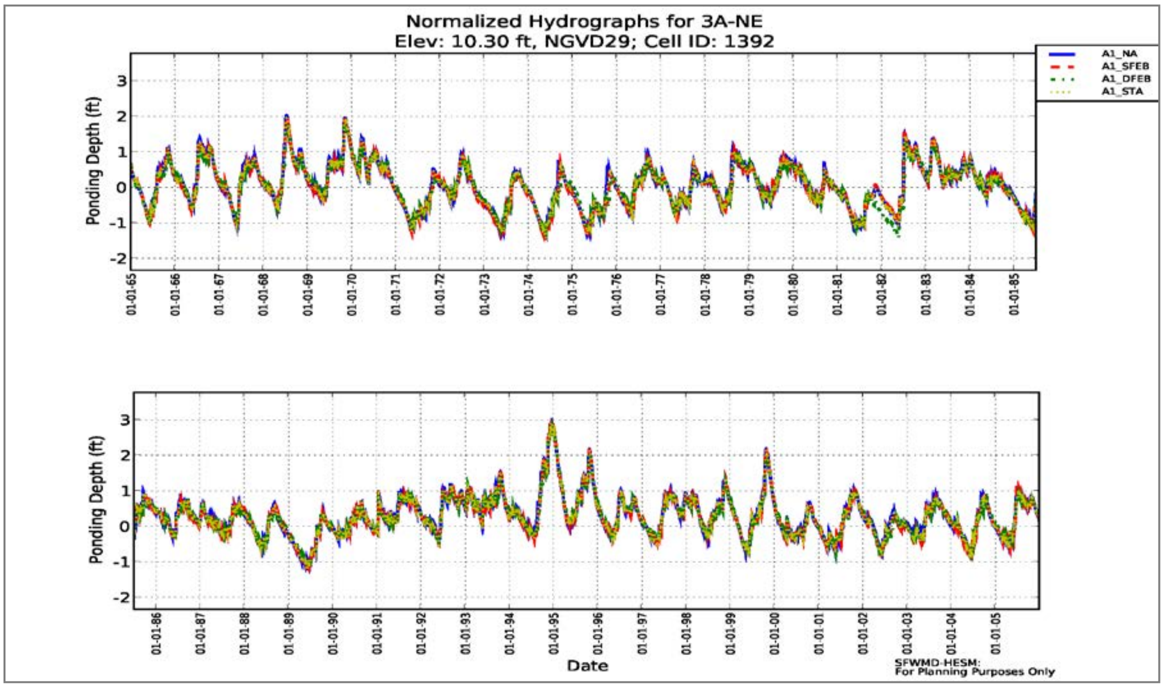
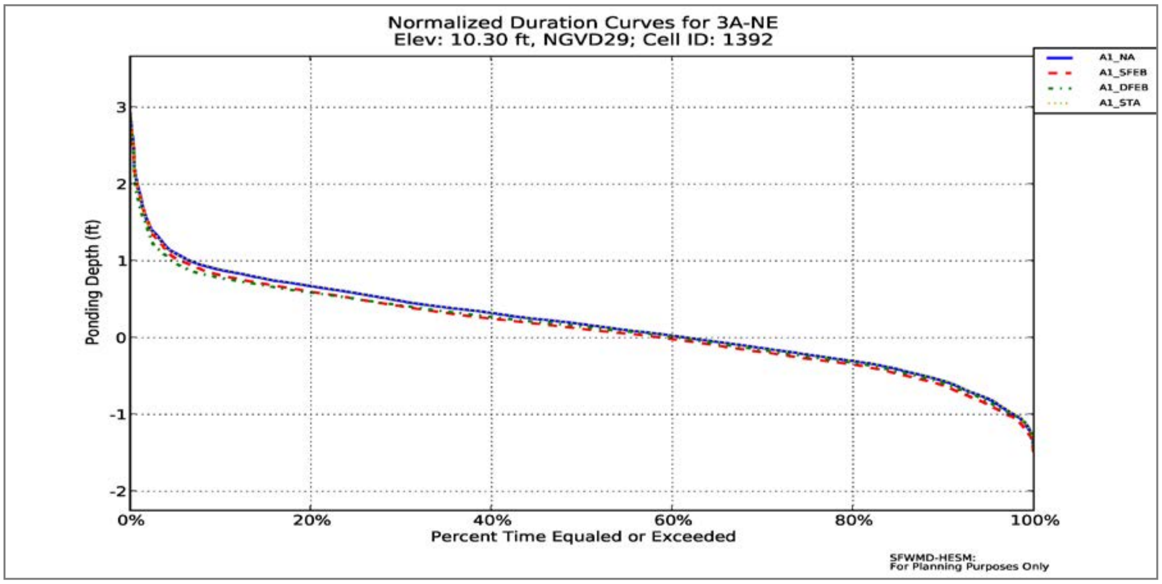


Figure 4-15 Ponding Depth Duration Curve for 3A-NE – All Alternatives



3A-3: A ponding depth hydrograph and ponding depth duration curve for 3A-3 are provided in **Figures 4-16** and **4-17,** respectively, for all Alternatives. Under the No Action Alternative, there are no changes to the ponding depths and water levels at this location within WCA 3A. Ponding depths at this site range between -1.2 feet below ground elevation and 4.0 feet above ground elevation. Water levels are above ground elevations for 75% of the time. Ponding depth varies seasonally.

Figure 4-16 Ponding Depth Hydrograph for 3A-3 – All Alternatives

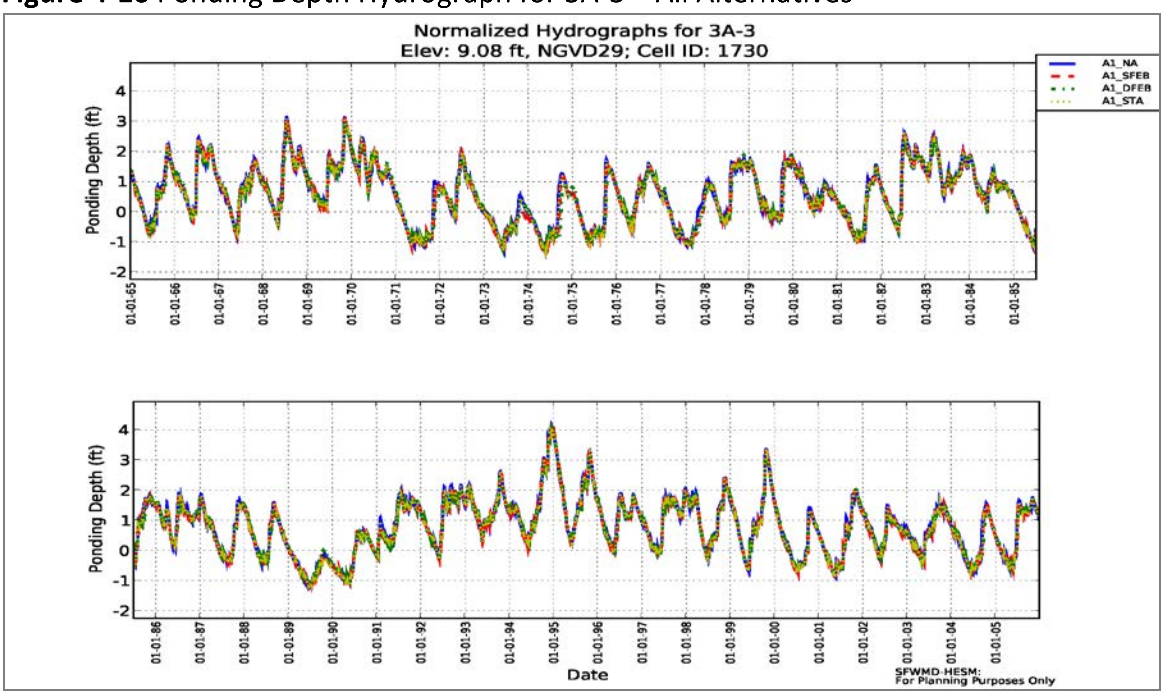
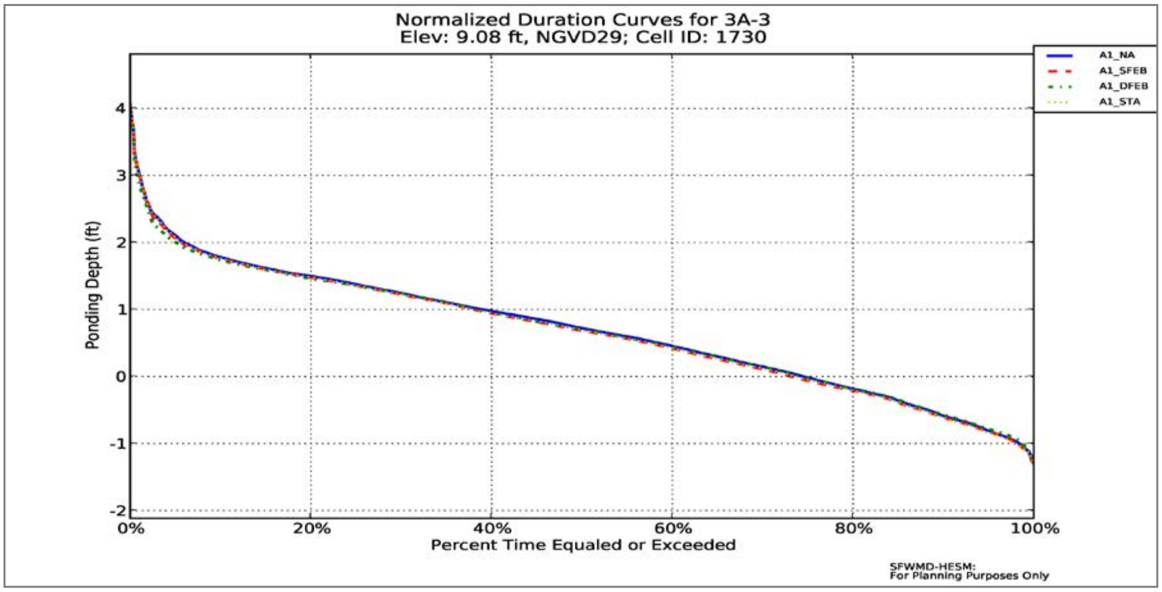


Figure 4-17 Ponding Depth Duration Curve for 3A-3 – All Alternatives



3A-4: A ponding depth hydrograph and ponding depth duration curve for 3A-4 are provided in **Figures 4-18** and **4-19,** respectively, for all Alternatives. Under the No Action Alternative, there are no changes to the ponding depth and water levels at this location within WCA 3A. Ponding depths at this site range between -0.7 feet below ground elevation and 4.0 feet above ground elevation. Water levels are above ground elevations for 90% of the time. Ponding depth varies seasonally.

Figure 4-18 Ponding Depth Hydrograph for 3A-4 – All Alternatives

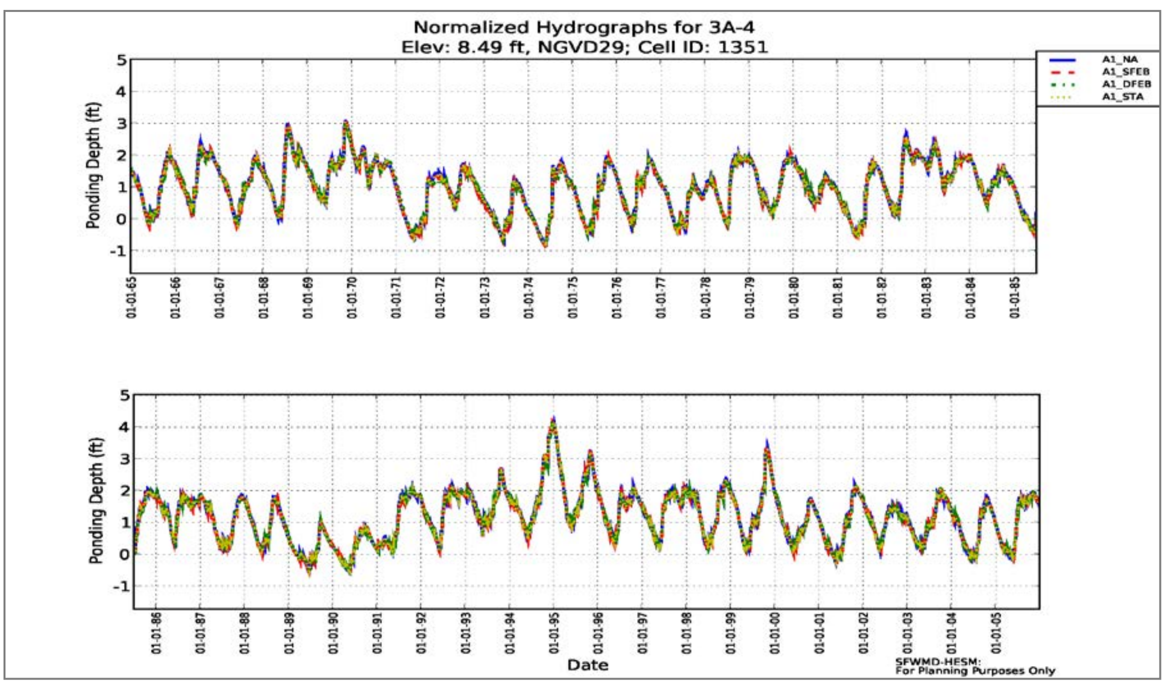
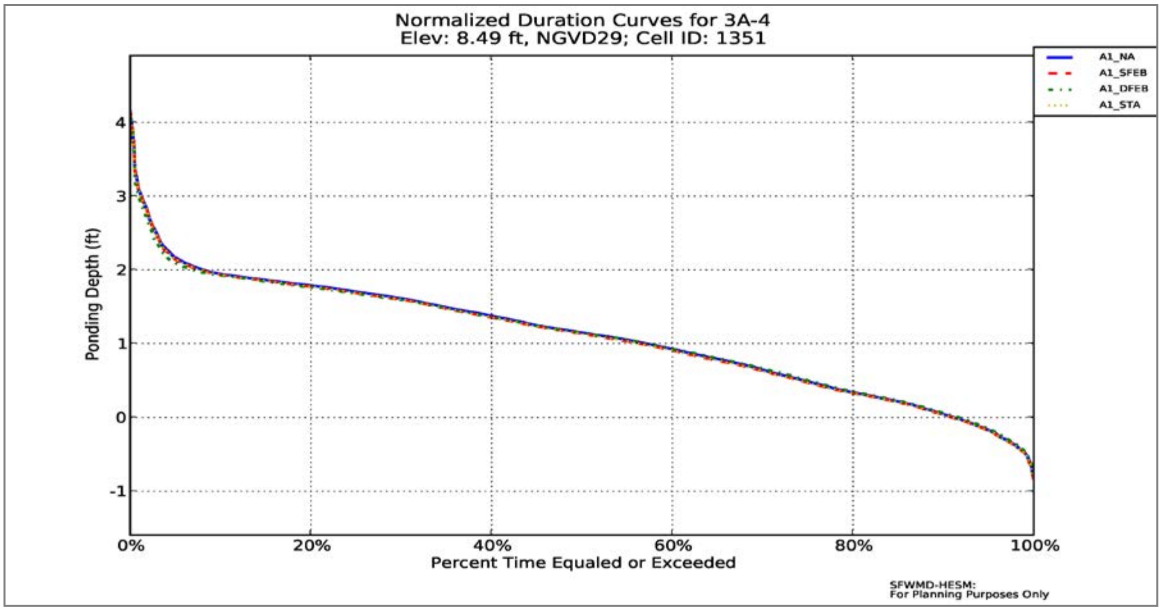


Figure 4-19 Ponding Depth Duration Curve for 3A-4 – All Alternatives



3A-28: A ponding depth hydrograph and ponding depth duration curve for 3A-28 are provided in **Figures 4-20** and **4-21,** respectively, for all Alternatives. Under the No Action Alternative, there are no changes to the ponding depth and water levels at this location within WCA 3A. Ponding depths at this site range between -0.3 feet below ground elevation and 4.9 feet above ground elevation. Water levels are above ground elevations for 99% of the time. Ponding depth varies seasonally.

Figure 4-20 Ponding Depth Hydrograph for 3A-28 – All Alternatives

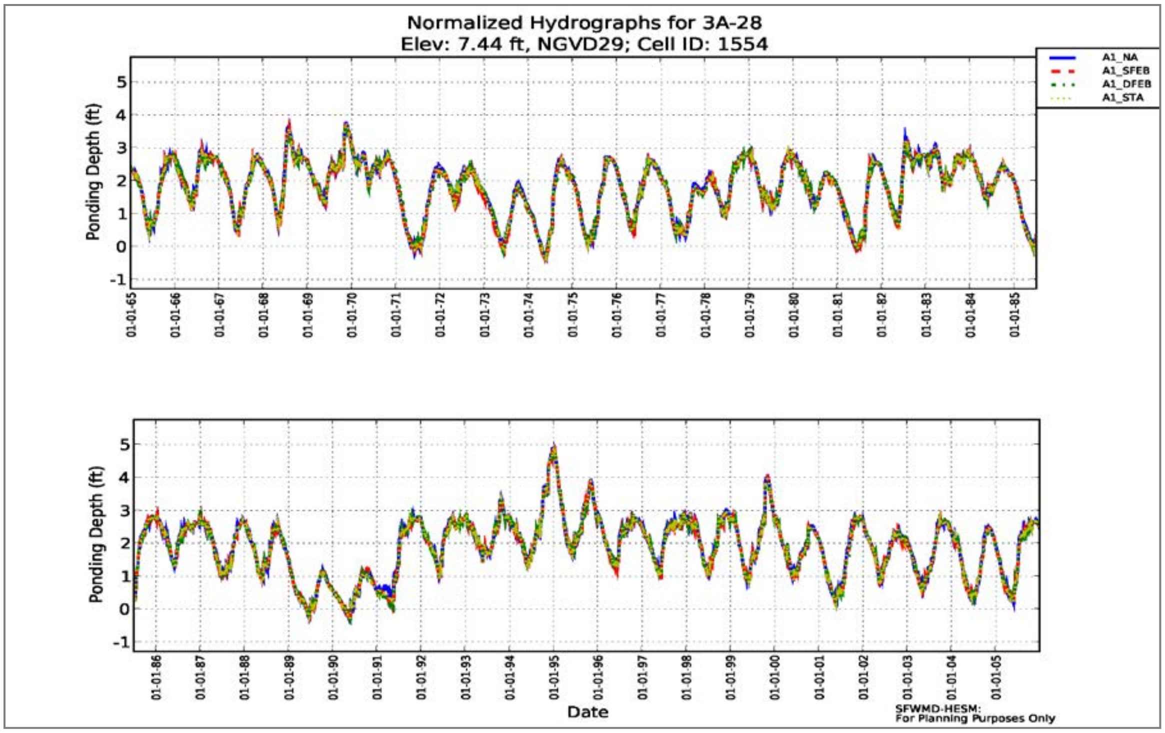
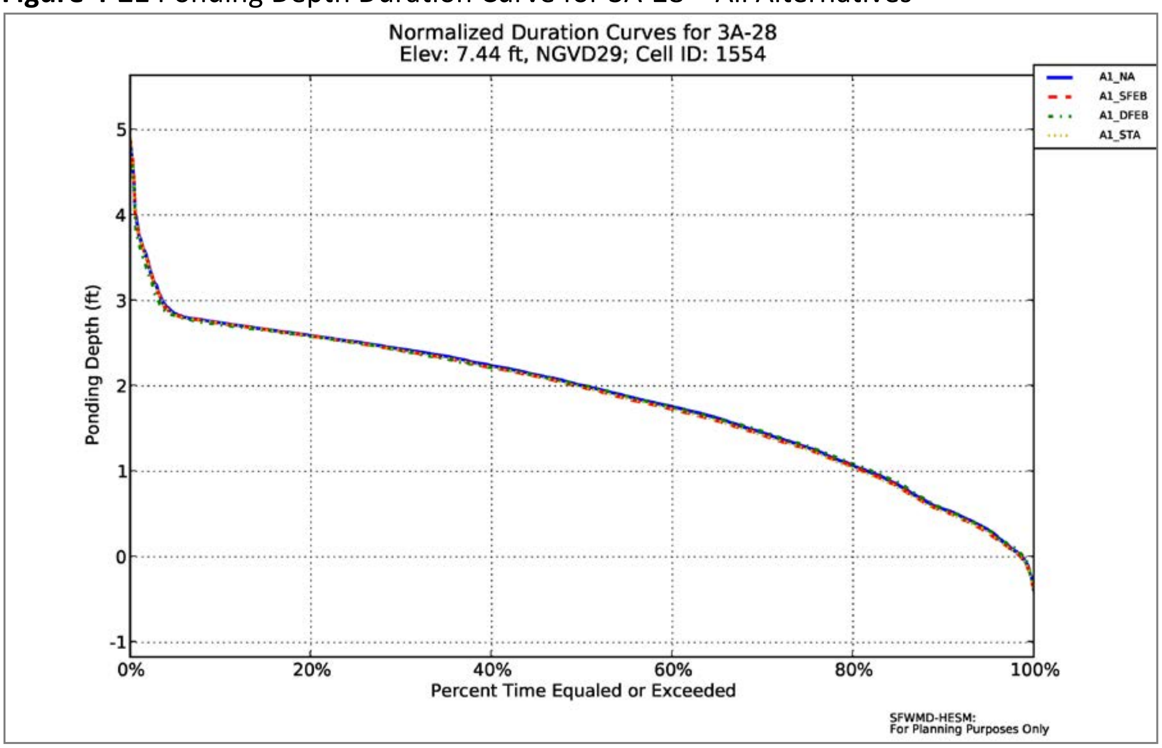


Figure 4-21 Ponding Depth Duration Curve for 3A-28 – All Alternatives



In WCA 3A, the average annual ponding depths range from 0 feet to over 3 feet above the surface (**Figure 4-10**). The northern portion of WCA 3A is dryer (depths range between 0 and 0.5 feet) while the water levels increase as it travels south, with depths ranging between 1-2 feet above the surface. Along the southeastern border of WCA 3A, water depths are the deepest and range between 2-3 feet. Two cells in this area contain water depths above three feet.

WCA 3A contains water between 60 and 365 days of the year (**Figure 4-11**). The hydroperiod is dryer along the northern perimeter of the area and range between 120-240 days of the year, with one cell between 60-120 days of hydroperiod per year. The hydroperiod increases in the southern portion of WCA 3A, with durations between 300-365 days of the year.

4.5.2.1.5 Holey Land Wildlife Management Area

Under the No Action Alternative, the surface water hydrology of the Holey Land would continue to function as it does today. Ponding depth hydrographs for the No Action Alternative were produced for Holey Land using three 2x2 Model grid cells. A 2x2 model grid cell location map is provided in **Figure 4-22**. The hydrographs of the ponding depths for the three grids are shown in **Figures 4-23**, **4-24**, and **4-25**.

Figure 4-22 2x2 Model Grid Cell Location Map of Holey Land

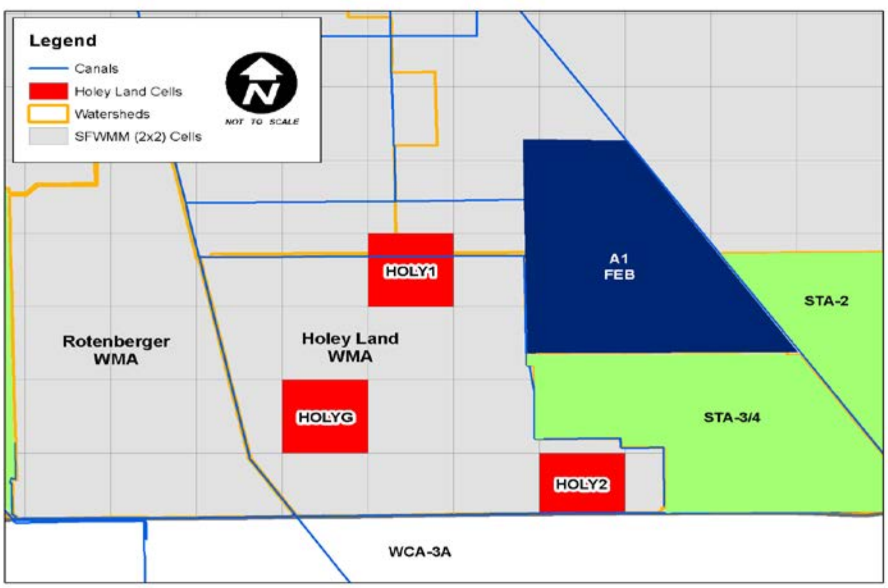


Figure 4-23 Ponding depth at 2x2 model grid cell Holy1 within the Holey Land (Alternative 1)

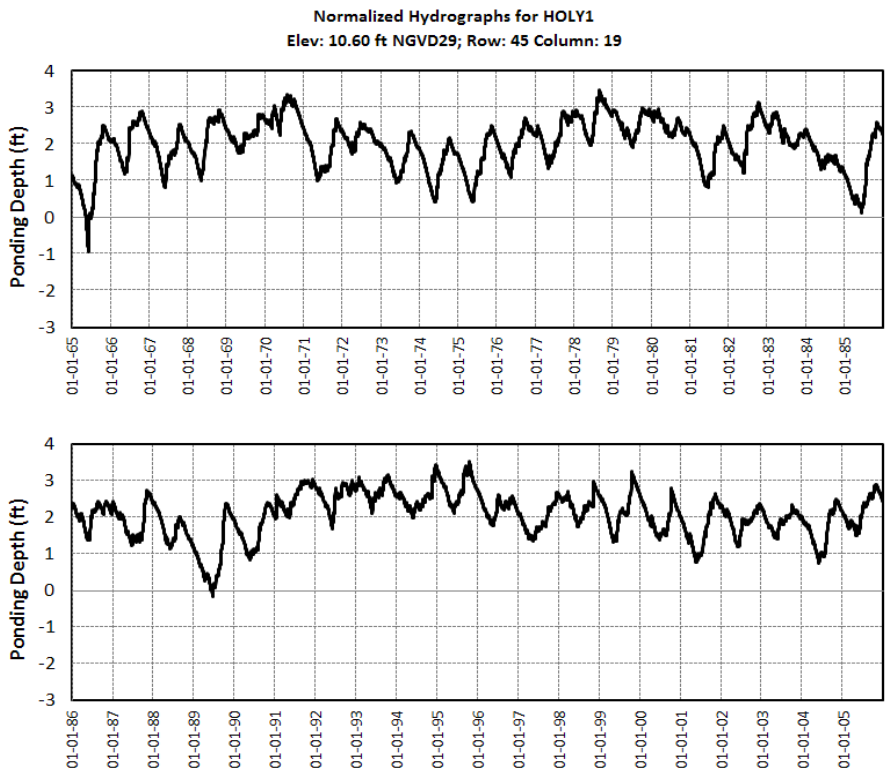


Figure 4-24 Ponding depth at 2x2 model grid cell Holy2 within the Holey Land (Alternative 1)

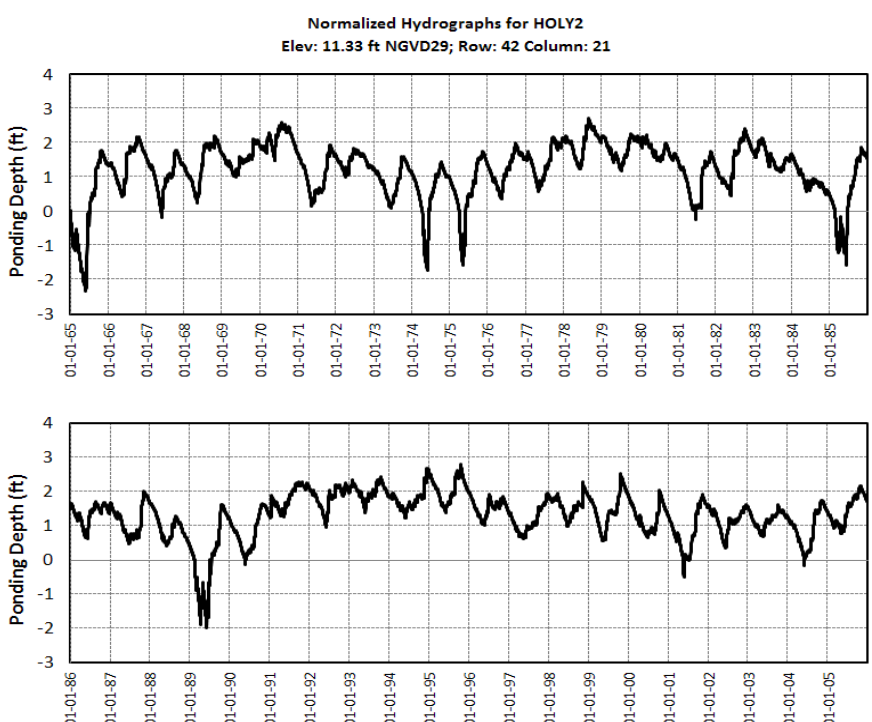
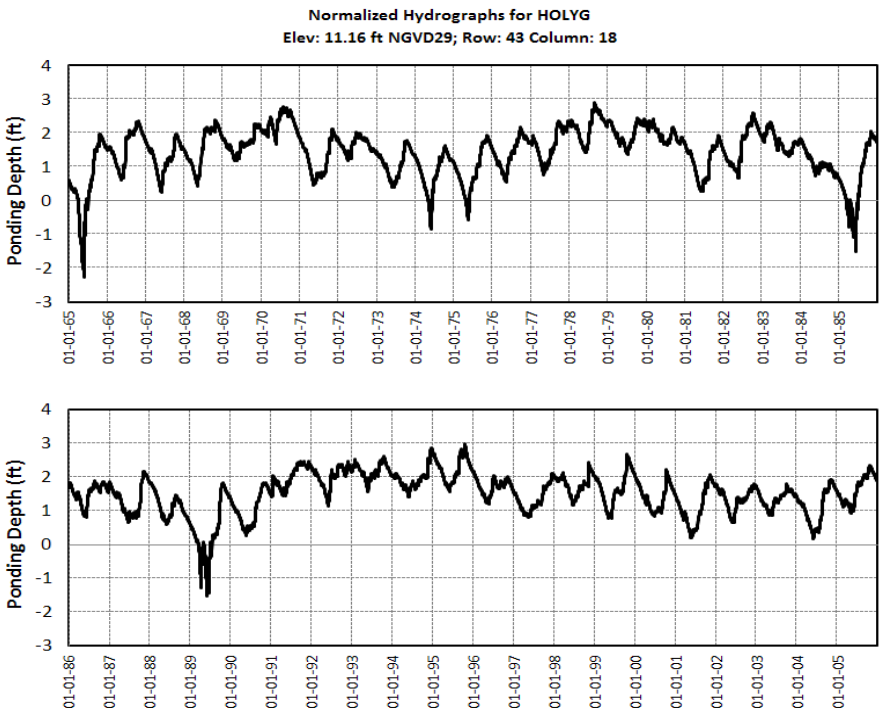


Figure 4-25 Ponding depth at 2x2 model grid cell HolyG within the Holey Land (Alternative 1)



4.5.2.2 Action Alternatives

4.5.2.2.1 Project Site

Construction and operation of all three Action Alternatives (Shallow FEB, Deep FEB, and STA) would affect surface water hydrology within the project site. Post construction, water from the North New River Canal and the Miami Canal would be pumped into the A-1 project site, which would be either the Shallow FEB, Deep FEB or the A-1 STA, and would be contained within levees and managed at various depths, unique to each Alternative. For Alternatives 2 (Shallow FEB) and 3 (Deep FEB), water released from the project site would enter either STA 2 or STA 3/4 before being released into the WCA 2A or 3A. For Alternative 4 (A-1 STA), water released from the project site would directly enter WCA 2A or WCA 3A. A summary of DMSTA-simulated inflow and outflow volumes on the A-1 project site for all Alternatives as compared to the No Action Alternative is provided in **Table 4-3**.

The Deep FEB has the greatest Average Annual volume of inflows because it provides the greatest storage capacity, so it has the ability to temporarily store more runoff per year on average than the Shallow FEB or the STA. This would be a benefit during storm events if the additional capacity is needed. The Shallow FEB, Deep FEB, and the STA each lose approximately

2,000 acre-feet of water per year (as seen in the differences between the inflows and outflows/diversions for each alternative).

Table 4-3 Project Site Inflow and Outflow Volumes

	Average Annual Volume (acre-feet per year)			
Parameter	Alternative 1: No Action	Alternative 2: Shallow FEB	Alternative 3: Deep FEB	Alternative 4: STA
Inflow	NA	274,000	336,000	252,000
Diversion	NA	NA	NA	5,000
Outflow	NA	272,000	334,000	245,000
Outflow and Diversion	NA	272,000	334,000	250,000

Figure 4-26 provides ponding depth hydrographs for the project site for Alternatives 2, 3, and 4. **Figure 4-27** provides ponding depth duration curves for the project site for Alternatives 2, 3, and 4. **Figures 4-28, 4-29**, and **4-30** show the monthly depths for the project site with median, quartile, and 10% to 90% percentiles for Alternative 2, Alternative 3, and Alternative 4, respectively.

Under Alternative 2 (Shallow FEB) water inflows and outflows on the project site would increase compared to the No Action Alternative, which has no water entering the site. An average of 274,000 acre-feet per year of water would enter the site, while 272,000 acre-feet per year would exit the site. The Shallow FEB would be operated at inflow water depths ranging from 0 to 4 feet and would be inundated with water depths greater than 1.5 feet for 60 percent of the time (**Figures 4-26** and **4-27**). For six months of the year, the site would average around 1 foot, varying from 0.3 feet to over three feet, while water depths would average from 2 to 3.5 feet during the rainy season (**Figure 4-28**). As compared to the No Action Alternative, Alternative 2 would increase the ponding stages on the site up to four feet under a managed operation plan (**Figure 4-26**).

Alternative 3 (Deep FEB) would result in the highest water inflows and outflows on the project site. This alternative could retain more water than the other Alternatives during a storm event due to the deeper capacity. Approximately 336,000 acre-feet per year of water would enter the site, while 333,000 acre-feet per year would exit the site. The Deep FEB would be operated at inflow water depths ranging from 0-12.5 feet and would be inundated with water depths greater than 1.75 feet for 60 percent of the time, greater than 6 feet for 20 percent of the time, and greater than 10 feet for 10 percent of the time (Figures 4-26, 4-27). For five months of the year, the site would average around 2 feet, varying from 0.3 feet to almost six feet, while water depths would average from 2 to 6 feet during the rainy season (Figure 4-29). Alternative 3 would increase the ponding stages on the site up to 12.5 feet under a managed operation plan (Figure 4-26).

Alternative 4 (STA) would result in an increase in water inflows and outflows on the project site compared to the No Action Alternative. Due to the need to operate the site to maintain STA vegetation, the site would also require surface water diversions. Approximately 252,000 acre-feet per year of water would enter the site, while 250,000 acre-feet per year would exit the site. Due to the necessary diversion of 5,000 acre-feet per year, Alternative 4 only has outflows of 245,000 acre-feet of water per year. Similar to Alternative 2, Alternative 4 would result in water depths at the project site ranging from 0 to 4 feet and the site would be inundated with water at depths of 1.5 feet or more for 60 percent of the time (**Figures 4-26** and **4-27**). For five months of the year, the site would average around 1.5 feet, varying from 0.5 feet to almost 2.5 feet, while water depths would average from 1.5 to 2.5 feet during the rainy season (**Figure 4-30**). As compared to the No Action Alternative, Alternative 4 would increase the ponding stages on the site up to 4 feet under a managed operation plan (**Figure 4-26**).

Figure 4-26 Ponding Depth Hydrographs for Project Site – Action Alternatives

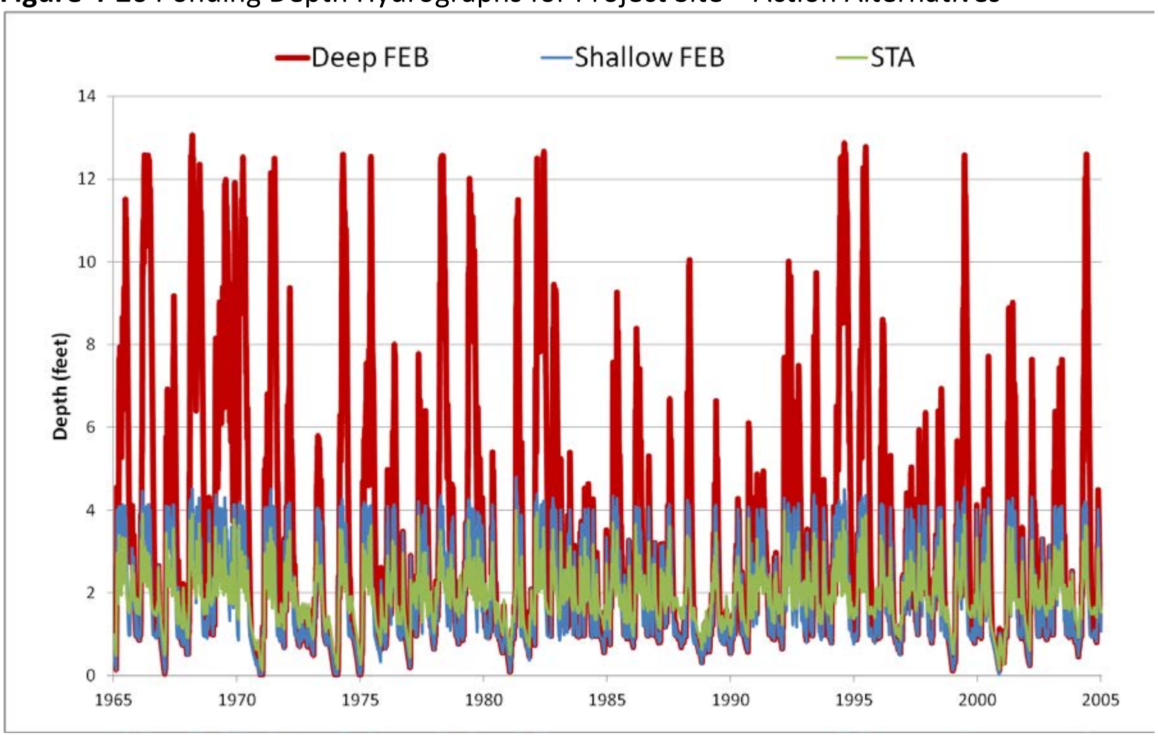
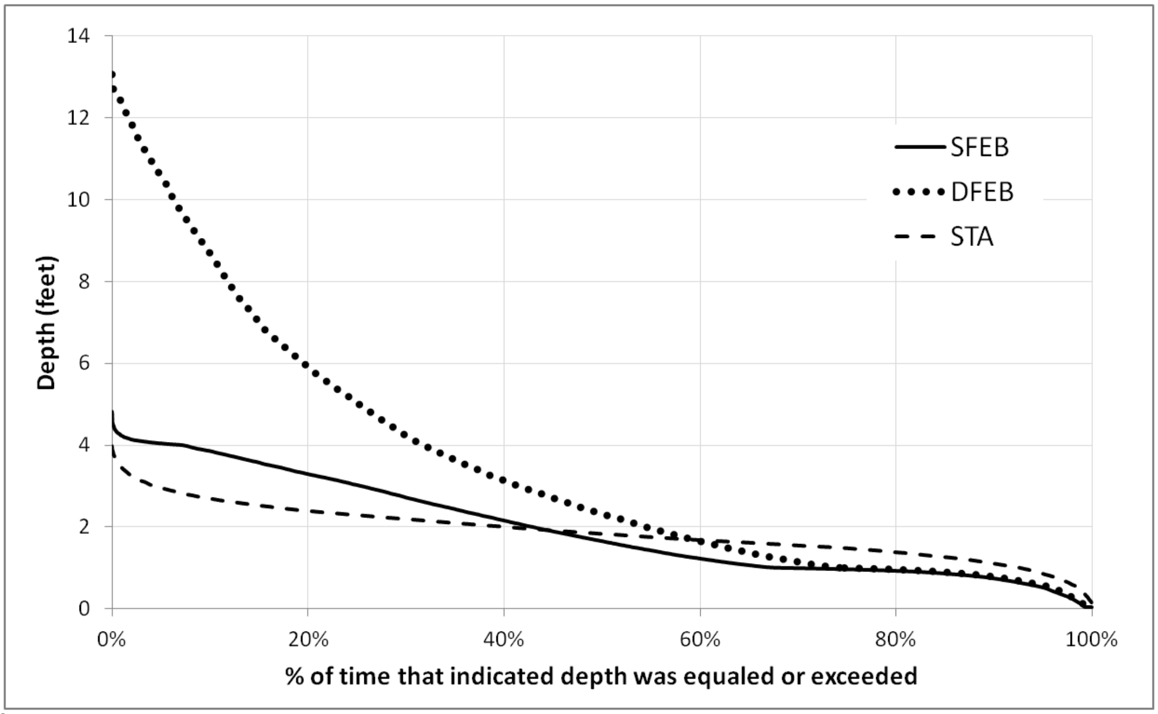


Figure 4-27 Ponding Depth Duration Curves for Project Site – Action Alternatives[a]



[a]DMSTA does not allow a treatment cell to dry out. Therefore, the limits of the modeling do not allow the simulated water levels to fall below zero.

Figure 4-28 Box and Whisker Plot of Monthly Depths on Project Site –Alternative 2

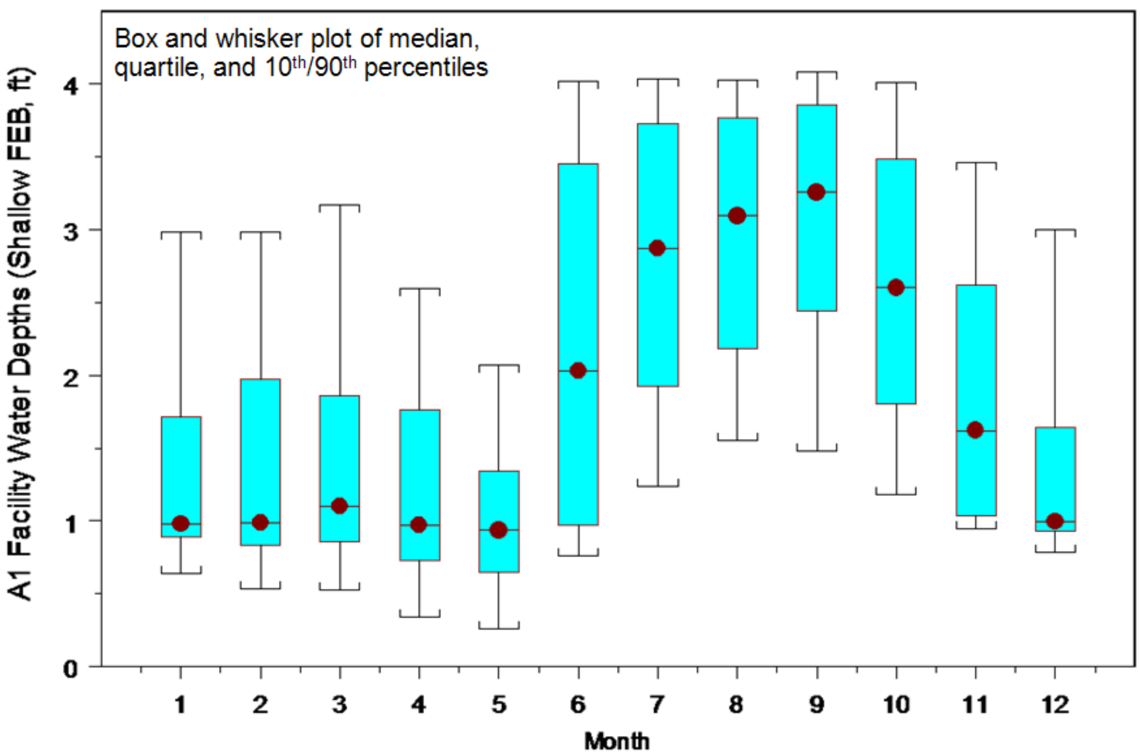


Figure 4-29 Box and Whisker Plot of Monthly Depths for Project Site – Alternative 3

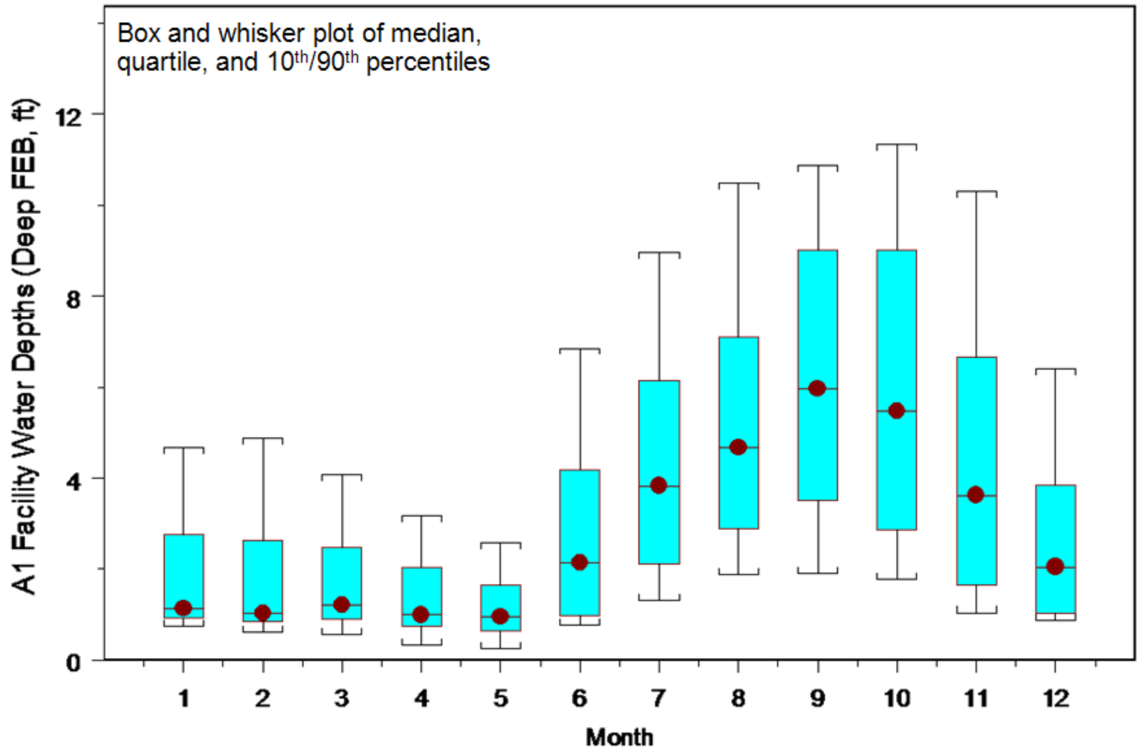
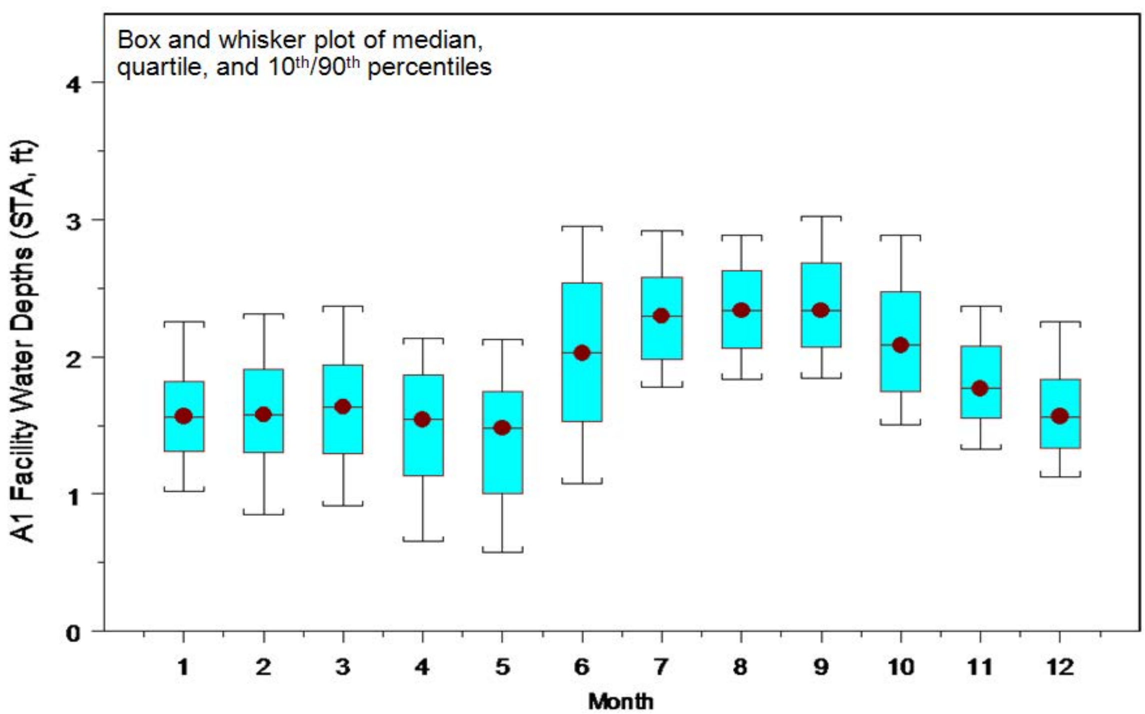


Figure 4-30 Box and Whisker Plot of Monthly Depths for Project Site – Alternative 4



4.5.2.2.2 STA 2 and STA 3/4

A summary is provided of STA 2 and STA 3/4 inflow and outflow volumes, water diversions (water routed around the STAs into the WCA due to high water events), and urban water supply (water routed around the STAs during low water events) in **Table 4-4**. For the Alternatives 2, 3, and 4, which reflect the increased inflows and outflows of the project site as modeled, rainfall and evapotranspiration for the project site are simulated by the DMSTA model, which does not result in runoff from the site. Instead runoff is stored within the FEB or STA facilities and is eventually discharged from the project site with other FEB or STA discharges. For the No Action Alternative, where no discharge from the site is expected, rainfall and evapotranspiration are simulated by the 2x2 model, which results in runoff from the project site. This results in slight variation in the calculations which are explained below.

Values from the bottom seven rows (STA 2, STA 3/4 and A-1 STA) of Table 4-4 are used to compare alternatives. For the No Action Alternative, central flow-path runoff is distributed to STA 2 and STA 3/4 consistent with existing conditions. At times, when conditions do not allow for the STAs to treat all runoff water prior to discharge, diversion to the WCAs may occur without treatment. A reduction in the diversion volumes in **Table 4-4** means that less untreated runoff is sent to the WCAs.

Alternatives 2, 3, and 4 all result in less STA diversion, although some STA diversion is still expected to occur as there will continue to be some flows that will exceed the physical capacity of the STA inflow structures or result in substantial damage to the STAs. Water diversions in the dry season, referred to as urban water supplies, are not affected by any Alternative. Under the No Action Alternative, the 'Inflow and Diversion' row in Table 4-4 is consistent with the Total Source Basin Flow Volume from **Table 4-1**. The change from the 'Inflow and Diversion' row and the 'Outflow and Diversion' row, from 834,000 to 831,000 (a 3,000 acre-feet per year or 0.3% difference) can be attributed to seepage, evaporation and effects from the modeling analysis. Change across the rows from the No Action Alternative to Alternatives 2, 3, and 4 will be due to factors such as runoff reduction, diversion/urban water supply, and rainfall/evapotranspiration/seepage.

Alternatives 2, 3, and 4 each result in different volume of water being diverted and different evapotranspiration and seepage rates. The resultant decreases in inflow and outflow volumes (to STA 2, STA 3/4, and the A-1 STA) summarized in Table 4-4 are due mainly to the following two reasons: 1) the project site has external levees and act as an impoundment and surface water runoff is not being exported as aggressively from the project site as compared to the No Action Alterative since water levels within the project site are not being managed for agricultural production; and 2) simulated water levels within an FEB or STA are substantially greater than water levels under the No Action Alternative and will result in greater evapotranspiration losses from the project site as compared to the No Action Alternative. Therefore, the volume of water as shown in the outflows, diversions, and urban water supply varies.

Table 4-4 STAs 2, 3/4, and A-1 Inflow and Outflow Volumes, and Diversions and Urban Water Supply

	Parameter	Average Annual Volume (acre-feet per year)			
		Alternative 1: No Action	Alternative 2: Shallow FEB	Alternative 3: Deep FEB	Alternative 4: STA
STA 2	Inflow	301,000	387,000	386,000	253,000
	Diversion	17,000	5,000	5,000	5,000
	Outflow	307,000	391,000	389,000	259,000
	Outflow and Diversion	324,000	396,000	394,000	264,000
STA 3/4	Inflow	504,000	401,000	407,000	275,000
	Diversion	12,000	6,000	1,000	5,000
	Outflow	495,000	392,000	397,000	269,000
	Outflow and Diversion	507,000	398,000	398,000	274,000
A-1 STA	Inflow	NA	NA	NA	252,000
	Diversion	NA	NA	NA	5,000
	Outflow	NA	NA	NA	245,000
	Outflow and Diversion	NA	NA	NA	250,000
STA 2, STA 3/4, and A-1 STA	Inflow	805,000	788,000	793,000	780,000
	Diversion	29,000	11,000	6,000	15,000
	Inflow and Diversion	834,000	799,000	799,000	795,000
	Outflow	802,000	783,000	786,000	773,000
	Outflow and Diversion	831,000	794,000	792,000	788,000
	Urban Water Supply	27,000	27,000	27,000	27,000
	Outflow, Diversion and Urban Water Supply	858,000	821,000	819,000	815,000

Figures 4-31 and 4-32 provide ponding depth hydrographs for STA 2 and STA 3/4, respectively, for Alternatives 2, 3, and 4. These figures show that the operation of Alternatives 2, 3, and 4 result in similar water depths in STA 2 and STA 3/4.

Figure 4-31 Ponding Depth Hydrographs for STA 2 – Action Alternatives

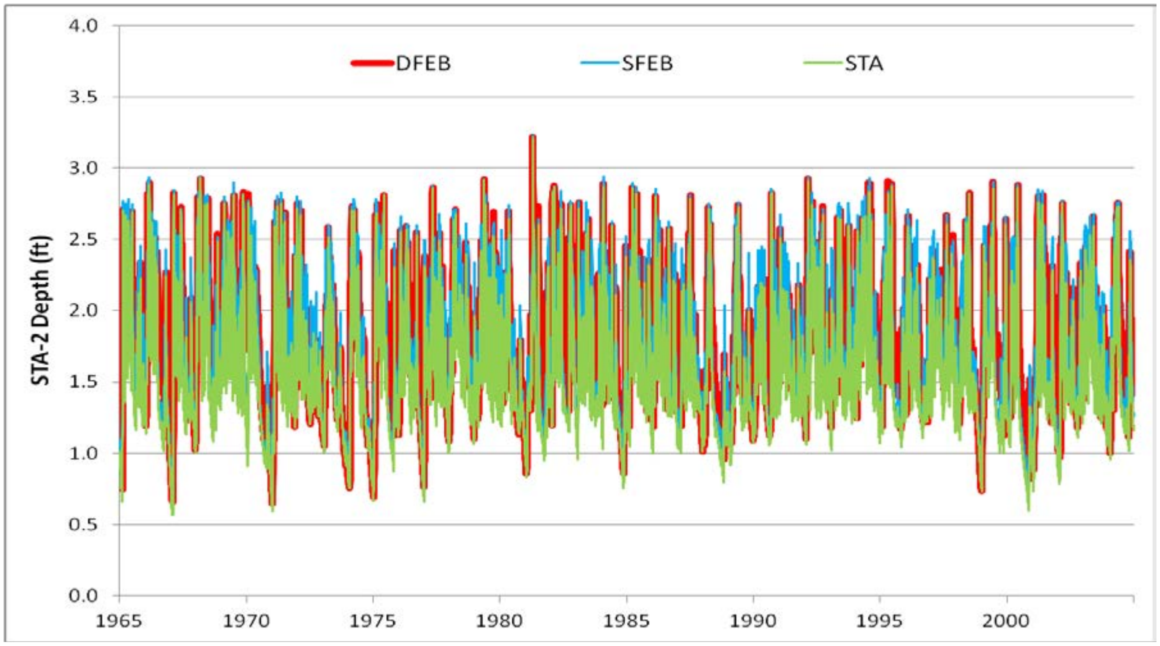
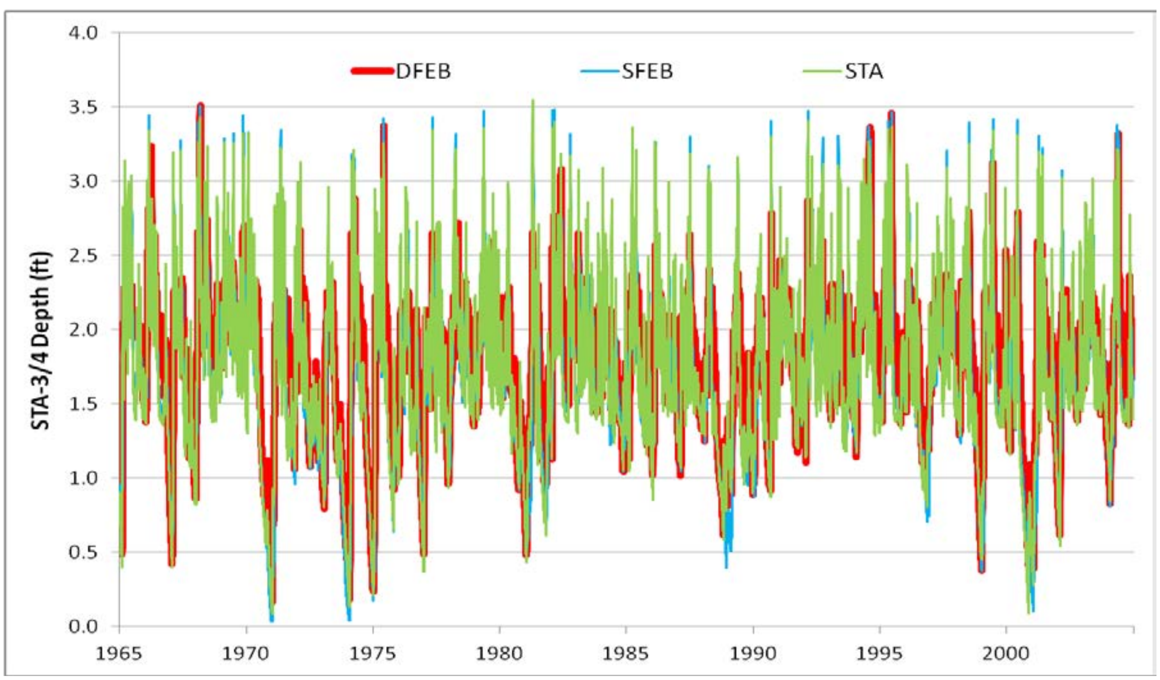


Figure 4-32 Ponding Depth Hydrographs for STA 3/4 – Action Alternatives



Compared to the No Action Alternative, average daily depths within STA 3/4 and STA 2 for each Action Alternative are described below:

Alternative 2 (Shallow FEB):

As compared to the No Action Alternative, the Shallow FEB would increase inflows into STA 2 by 72,000 acre-feet per year and outflows by 84,000 acre-feet per year, while diversions are decreased by 12,000 acre-feet per year (**Table 4-4**). **Figures 4-33 and 4-34** provide ponding depth hydrographs for STA 2 and STA 3/4, respectively, for Alternative 2. The Shallow FEB would slightly decrease the peak stages and raise the low water stages in STA 2.

For STA 3/4, the Shallow FEB would decrease inflows 103,000 acre-feet per year and outflows by 103,000 acre-feet per year, while diversions are decreased by 6,000 acre-feet per year (Table 4-4). In general, the Shallow FEB would lower the peak water stages in STA 3/4 as the majority of high water elevations are lowered.

Figure 4-33 Ponding Depth Hydrographs for STA 2 – Alternative 2 (Shallow FEB) and No Action Alternative

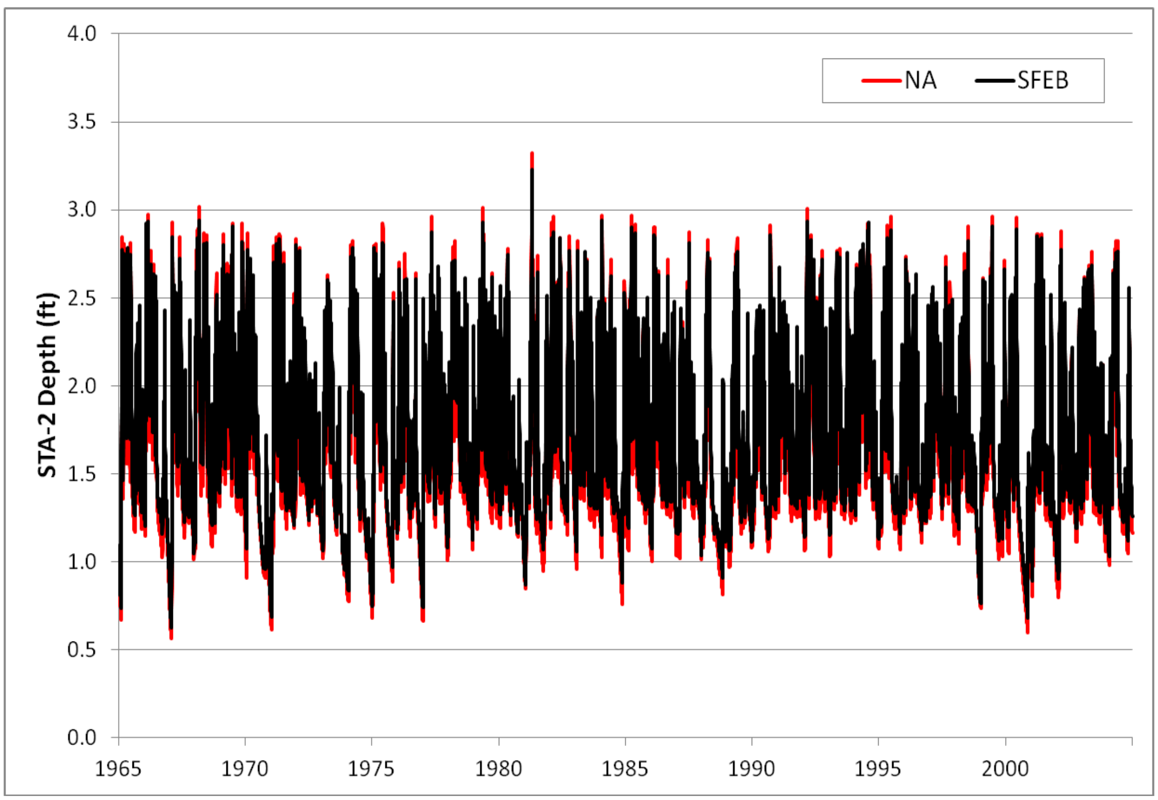
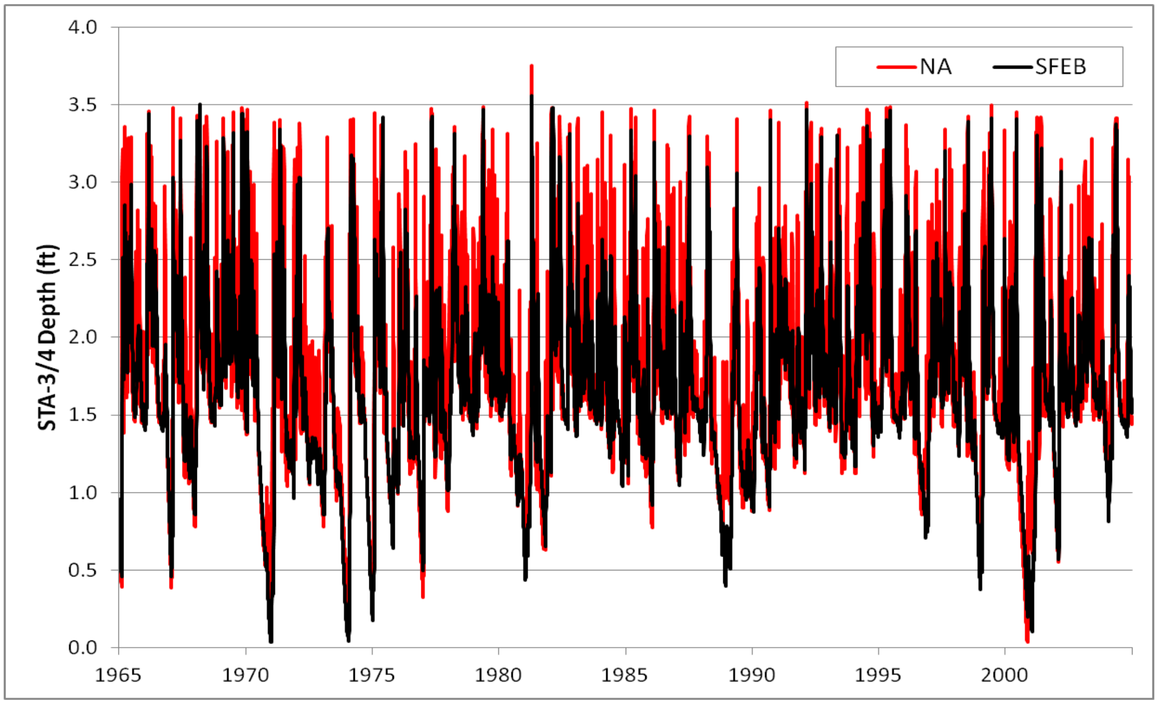


Figure 4-34 Ponding Depth Hydrographs for STA 3/4 – Alternative 2 (Shallow FEB) and No Action Alternative



Alternative 3 (Deep FEB):

As compared to the No Action Alternative, the Deep FEB would increase inflows into STA 2 by 85,000 acre-feet per year and outflows by 82,000 acre-feet per year, while reducing the diversions by 12,000 acre-feet per year (**Table 4-4**). **Figures 4-35** and **4-36** provide ponding depth hydrographs for STA 2 and STA 3/4, respectively, for Alternative 3. The Deep FEB would slightly lower the peak water stages in STA 2, and increase the low water stages as the majority of low water events would be raised (**Figure 4-35**).

For STA 3/4, the Deep FEB would decrease inflows by 97,000 acre-feet per year and outflows by 98,000 acre-feet per year, while decreasing diversions by 11,000 acre-feet per year (**Table 4-4**). The Deep FEB would lower the peak water stages in STA 3/4 approximately one foot as the high water events would be reduced (**Figure 4-36**).

Figure 4-35 Ponding Depth Hydrographs for STA 2 – Alternative 3 (Deep FEB) and No Action Alternative

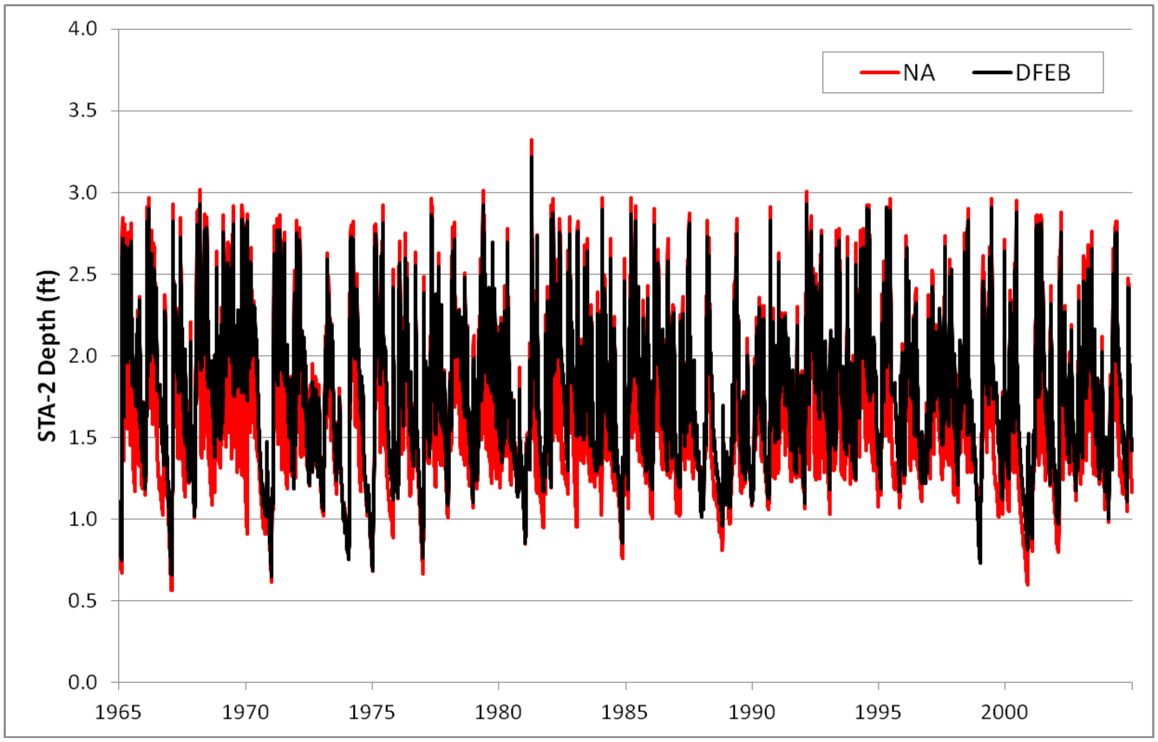
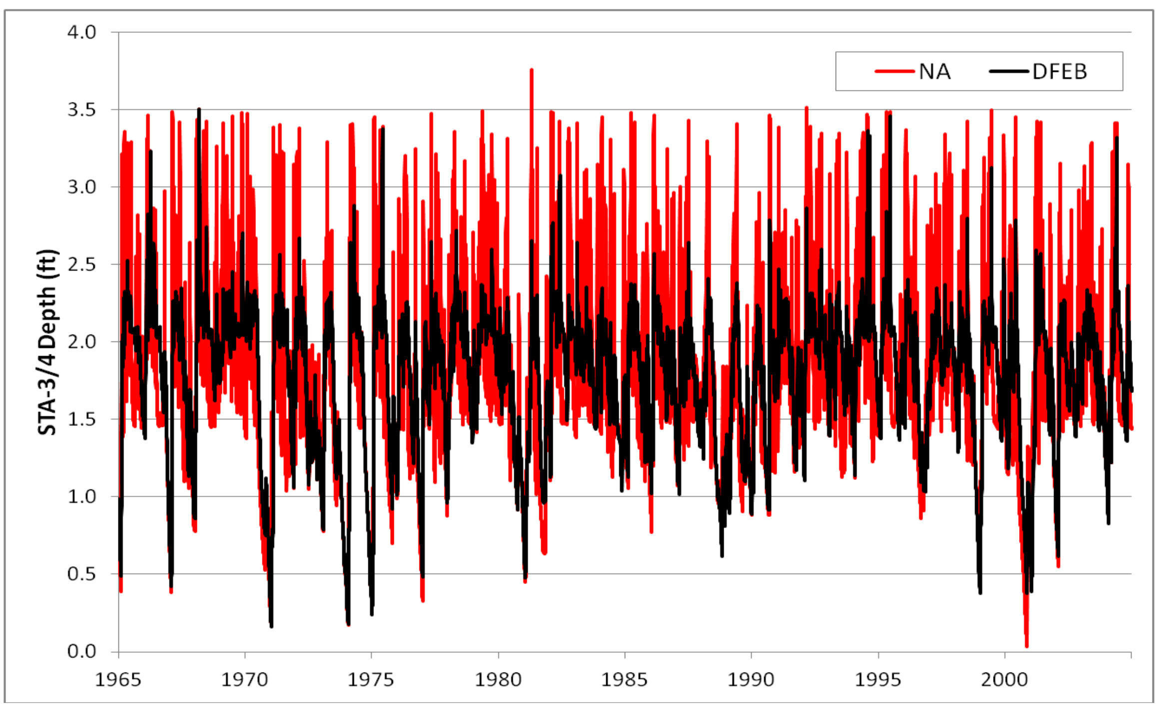


Figure 4-36 Ponding Depth Hydrographs for STA 3/4 – Alternative 3 (Deep FEB) and No Action Alternative



Alternative 4 (STA):

As compared to the No Action alternative, utilization of the A-1 STA would decrease inflows into STA 2 by 48,000 acre-feet per year and outflows by 48,000 acre-feet per feet, while diversions are decreased by 12,000 acre-feet per year (**Table 4-4**). **Figure 4-37** and **Figure 4-38** provide ponding depth hydrographs and ponding depth duration curve for STA 2 and STA 3/4, respectively. The A-1 STA would decrease the peak stages in STA 2 and STA 3/4 as excess water would be shared among the STAs (STA 2, STA 3/4, and the project site STA). However, the need to maintain water levels in the A-1 STA would limit the ability to preferentially route water to STA 2 to maintain water levels resulting is more frequent low water stages in STA 2.

For STA 3/4, utilization of the A-1 STA would decrease inflows 229,000 acre-feet per year and outflows by 226,000 acre-feet per year (**Table 4-4**). Diversions would also be decreased 7,000 acre-feet per year for STA 3/4. For STA 3/4, the STA would lower the peak water stages, and decrease the low water stages resulting in lower water tables during the dry seasons. The lower water elevations during the dry season are due to the STA requiring water to maintain its wetland vegetation. **Figure 4-39** and **Figure 4-40** provide ponding depth hydrographs and ponding depth duration curve for STA 3/4 for Alternative 4.

Figure 4-37 Ponding Depth Hydrographs for STA 2 – Alternative 4 (STA)

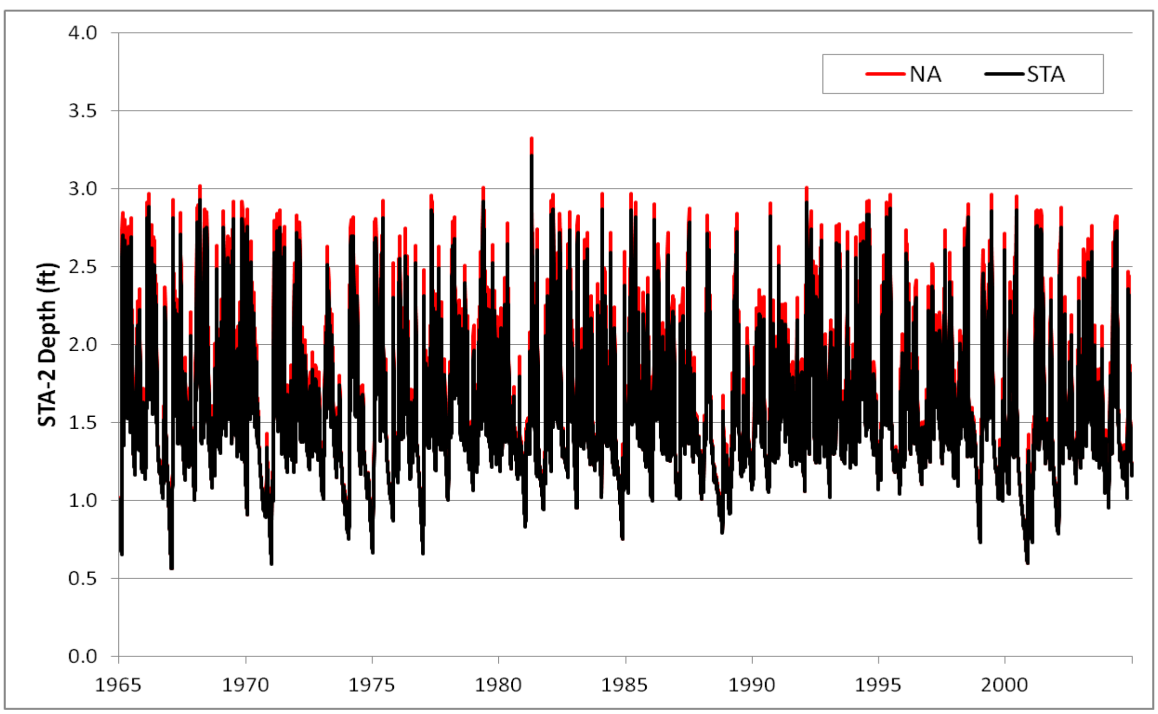


Figure 4-38 Ponding Depth Duration Curves for STA 2 – All Alternatives

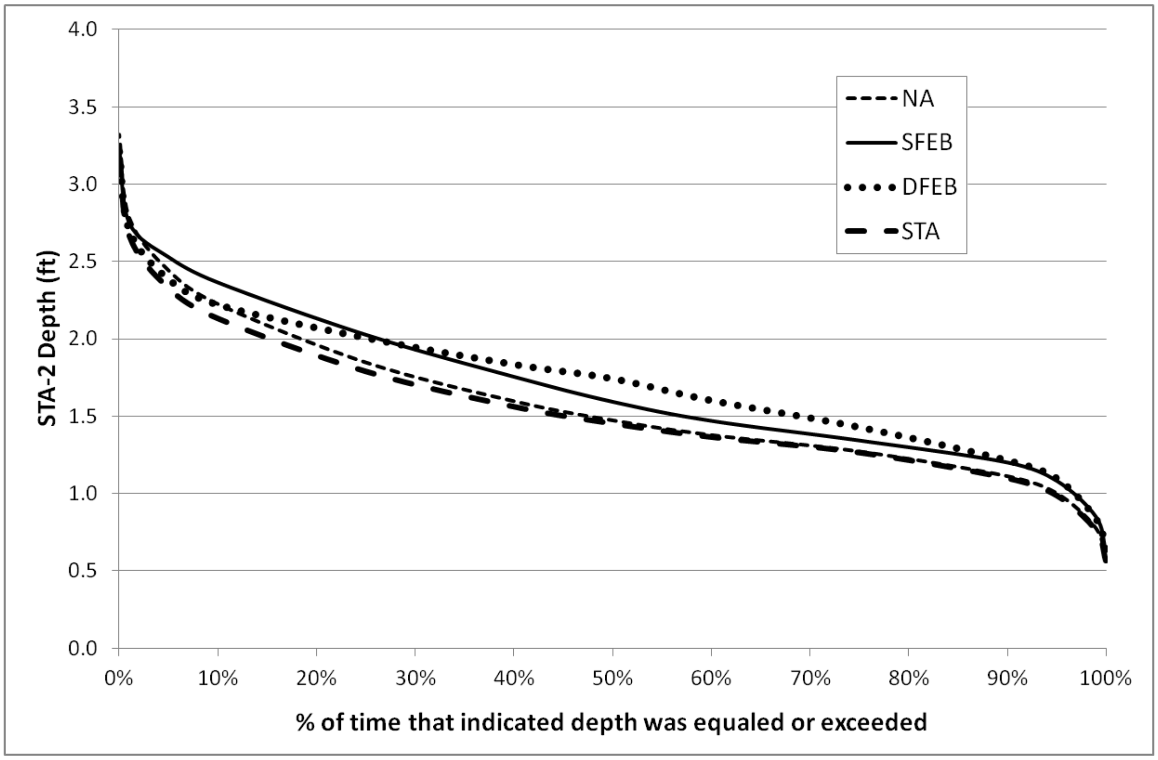


Figure 4-39 Ponding Depth Hydrographs for STA 3/4 – Alternative 4 (STA)

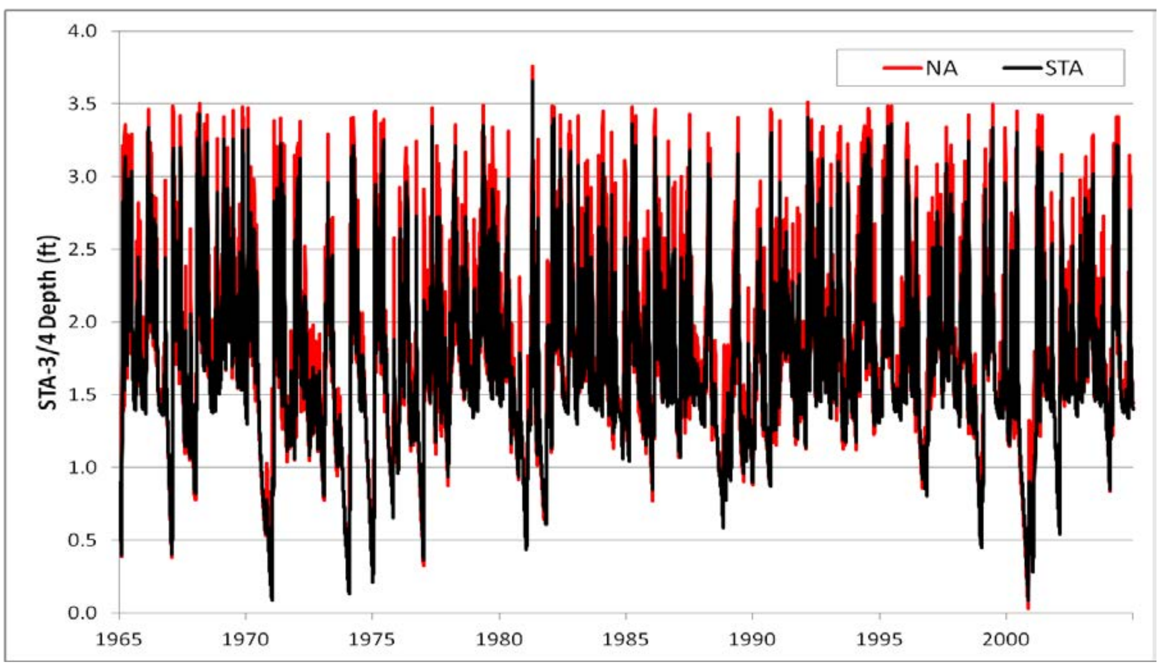
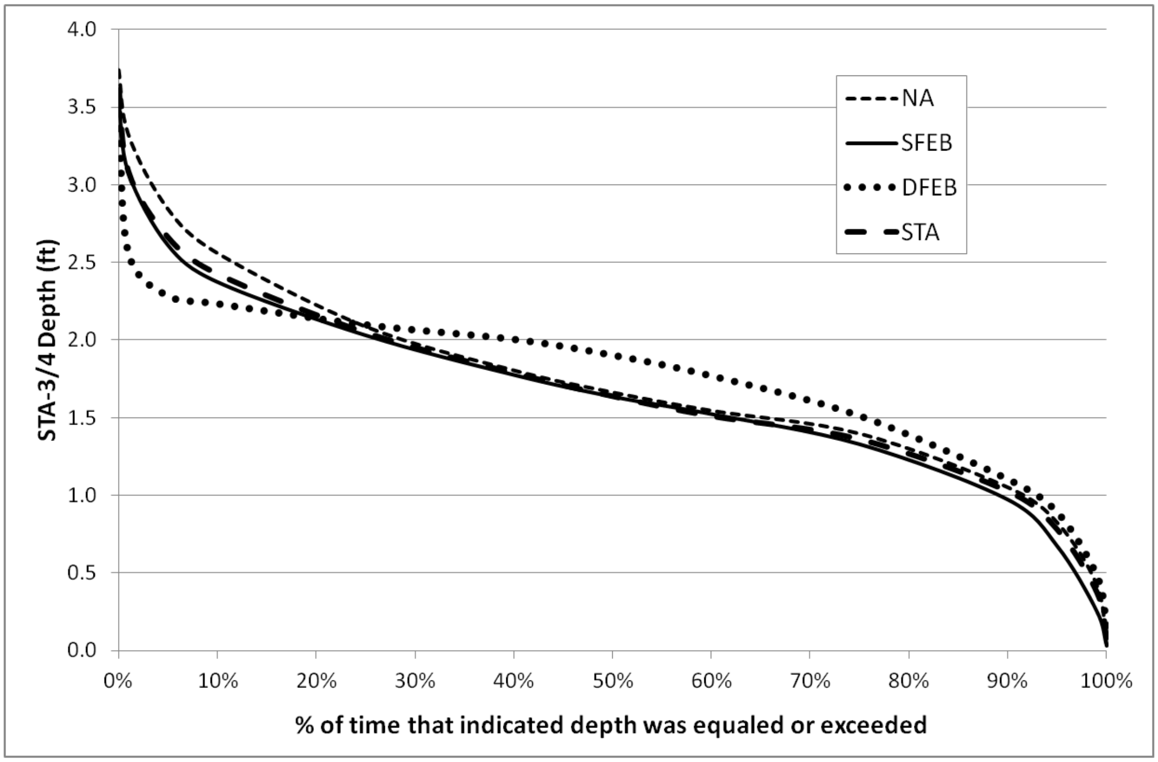


Figure 4-40 Ponding Depth Duration Curves for STA 3/4 – All Alternatives



The ability of DMSTA to accurately predict the duration and severity of STA dryout is limited. Therefore, it is difficult to quantify the number of dryout events simulated to be eliminated/created within STA 2 and STA 3/4 by the different alternatives. It can be conceived that Alternatives 2 and 3 would result in less frequent dryout conditions in STA 2 and STA 3/4 since these alternatives send water in an advantageous manner to the existing STA. As for the A-1 STA Alternative, dry-outs in the existing STAs could actually increase with Alternative 4 due the operations of the proposed STA, which would need a portion of water currently sent to the existing STAs to keep it hydrated during dry periods. Dryouts are considered deleterious to STA performance because with rewetting there may be an undesirable release of phosphorus.

4.5.2.2.3 WCA 2A

WCA 2A inflows include treated flows from STA 2 and STA 3/4, STA 2 and STA 3/4 diversion flows and urban water supply flows. The total outflows from STA 2 and STA 3/4 including diversions and urban water supply is 858,000 acre-feet per year under the No Action Alternative. Based on the results of the Glades LECSA RSM modeling, WCA 2A would receive approximately 458,000 acre-feet per year of inflows via the L-6 Canal and the S-7 pump station for the No Action Alternative. All of the action alternatives produced ponding and hydroperiods very similar to the No Action Alternative, with only some minor variations (**Table 4.5**).

Alternatives 2, 3, and 4 result in 10,000; 14,000; and 13,000 acre-feet less water per year entering into WCA 2A. This reduction is mainly due to operating a 15,000 acre FEB or STA as compared to the No Action Alternative, which retains water without any discharge to the surrounding area.

Table 4-5 WCA 2A Average Annual Volume of Inflows

	Parameter	Average Annual Volume (acre-feet per year)			
		Alternative 1: No Action	Alternative 2: Shallow FEB	Alternative 3: Deep FEB	Alternative 4: STA
WCA 2A	**Inflows**	458,000	448,000	444,000	445,000

Performance measure graphics were generated for several gauge locations within WCA 2A and for the entire area. A gauge location map is provided in **Figure 4-5**. Hydrographs of daily ponding depths and duration curves of ponding depths are provided for two WCA 2A gauge locations (2A-17 and 2A-300) in **Figures 4-6, 4-7, 4-8 and 4-9**. **Figures 4-41, 4-42 and 4-43** provide average annual ponding depths, hydroperiod distribution and the hydroperiod difference for Alternative 2 respectively for WCA 2A. **Figures 4-44, 4-45 and 4-46** provide average annual ponding depths, hydroperiod distribution and the hydroperiod difference for Alternative 3 respectively for WCA 2A. **Figures 4-47, 4-48 and 4-49** provide average annual ponding depths, hydroperiod distribution and the hydroperiod difference for Alternative 4 respectively for WCA 2A.

Alternative 2:

For Alternative 2, there is an increase in the total outflows (72,000 acre-feet more per year) from STA 2 as compared to the No Action Alternative, while there is a decrease in total outflows from STA 3/4 (109,000 acre-feet less per year). This change is seen in the downstream areas as Alternative 2 (Shallow FEB) delivers approximately 10,000 acre-feet per year less flow via the L-6 Canal and S-7 pump station to WCA 2A, producing very slightly deeper ponding and slightly longer hydroperiods in localized areas in northwest WCA 2A as compared to the No Action Alternative. Alternative 2 results in approximately 600 acres of WCA 2A (0.6 percent) experiencing hydroperiods 17 days per year longer than the No Action Alternative (**Figure 4-43**).

Figure 4-41 Average Annual Ponding Depth for WCA 2A and WCA 3A – Alternative 2 (Shallow FEB)

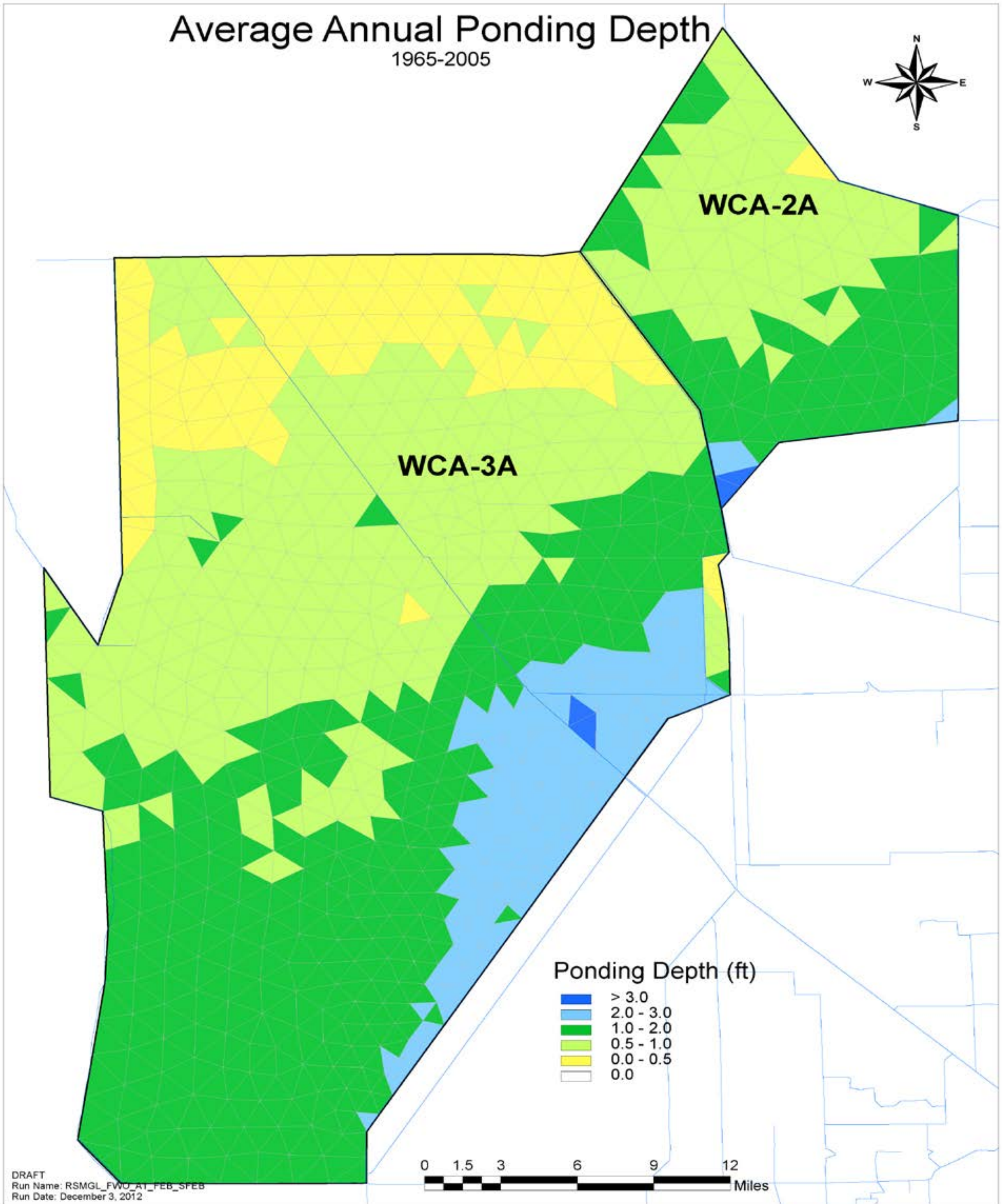


Figure 4-42 Average Annual Hydroperiod for WCA 2A and WCA 3A – Alternative 2 (Shallow FEB)

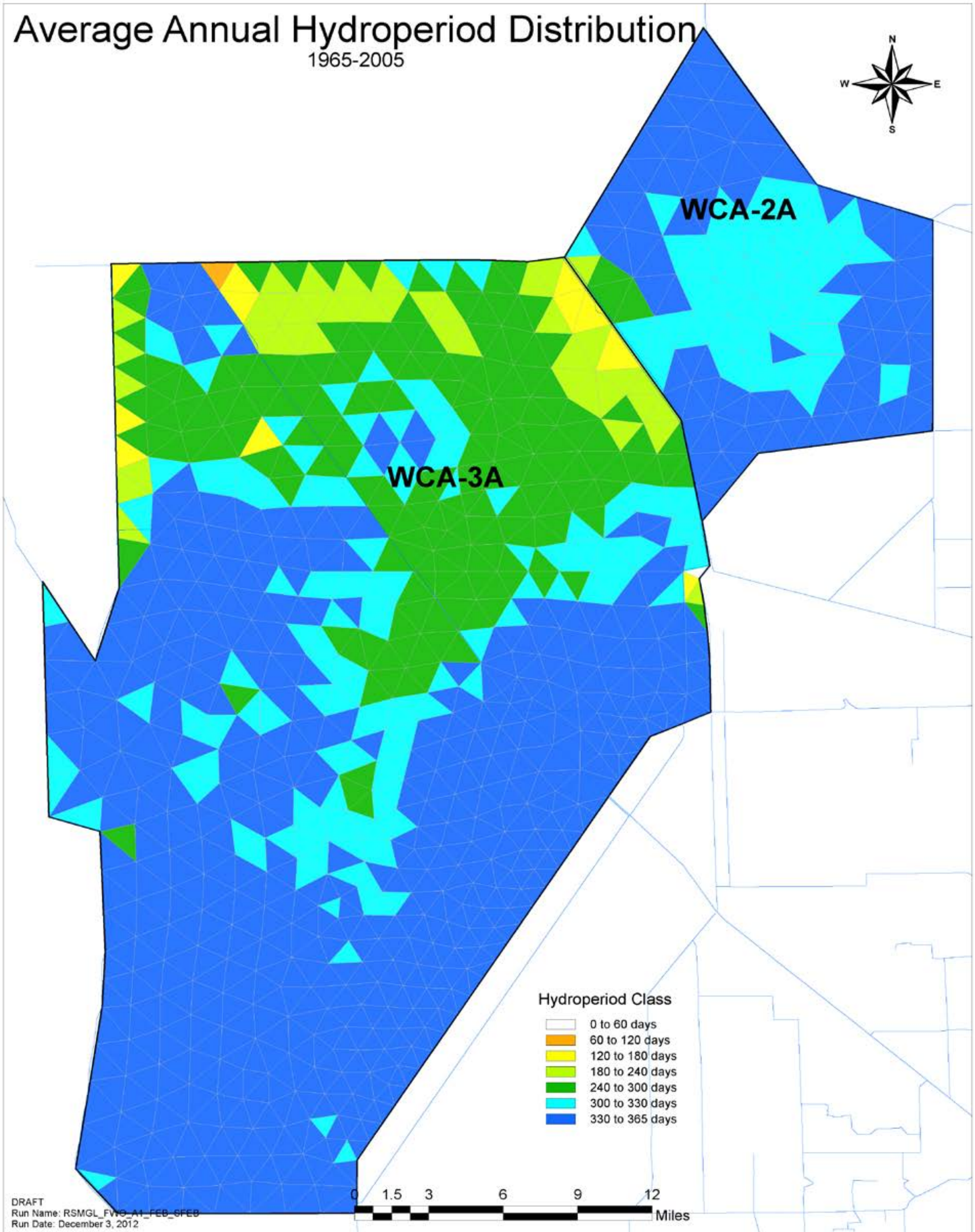
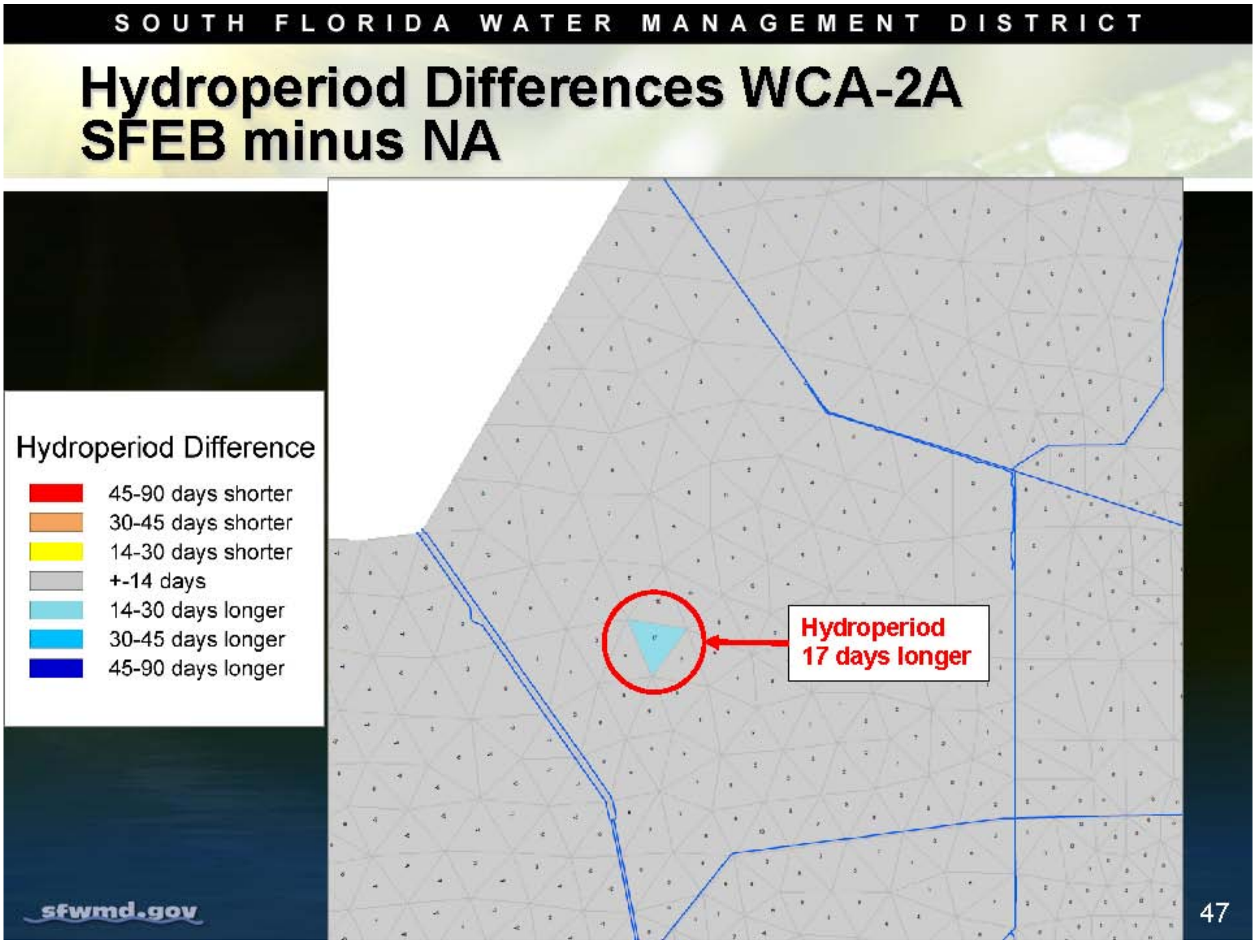


Figure 4-43 Changes in Hydroperiod in WCA 2A – Alternative 2 (Shallow FEB)



Alternative 3:

For Alternative 3, there is an increase in the total outflows including diversions (70,000 acre-feet more per year) from STA 2 as compared to the No Action Alternative, while there is a decrease in total outflows from STA 3/4 (109,000 acre-feet less per year), including diversions. This change is seen in the downstream areas as Alternative 3 (Deep FEB) delivers approximately 14,000 acre-feet per year less flow via the L-6 Canal and S-7 pump station to WCA 2A, producing very slightly deeper ponding and slightly longer hydroperiods in areas in northwest WCA 2A compared to the No Action Alternative. Alternative 3 results in 3,000 acres of WCA 2A (3.1 percent) experiencing hydroperiods 15 to 18 days per year longer than the No Action Alternative (**Figure 4-46**).

Figure 4-44 Average Annual Ponding Depth for WCA 2A and WCA 3A – Alternative 3 (Deep FEB)

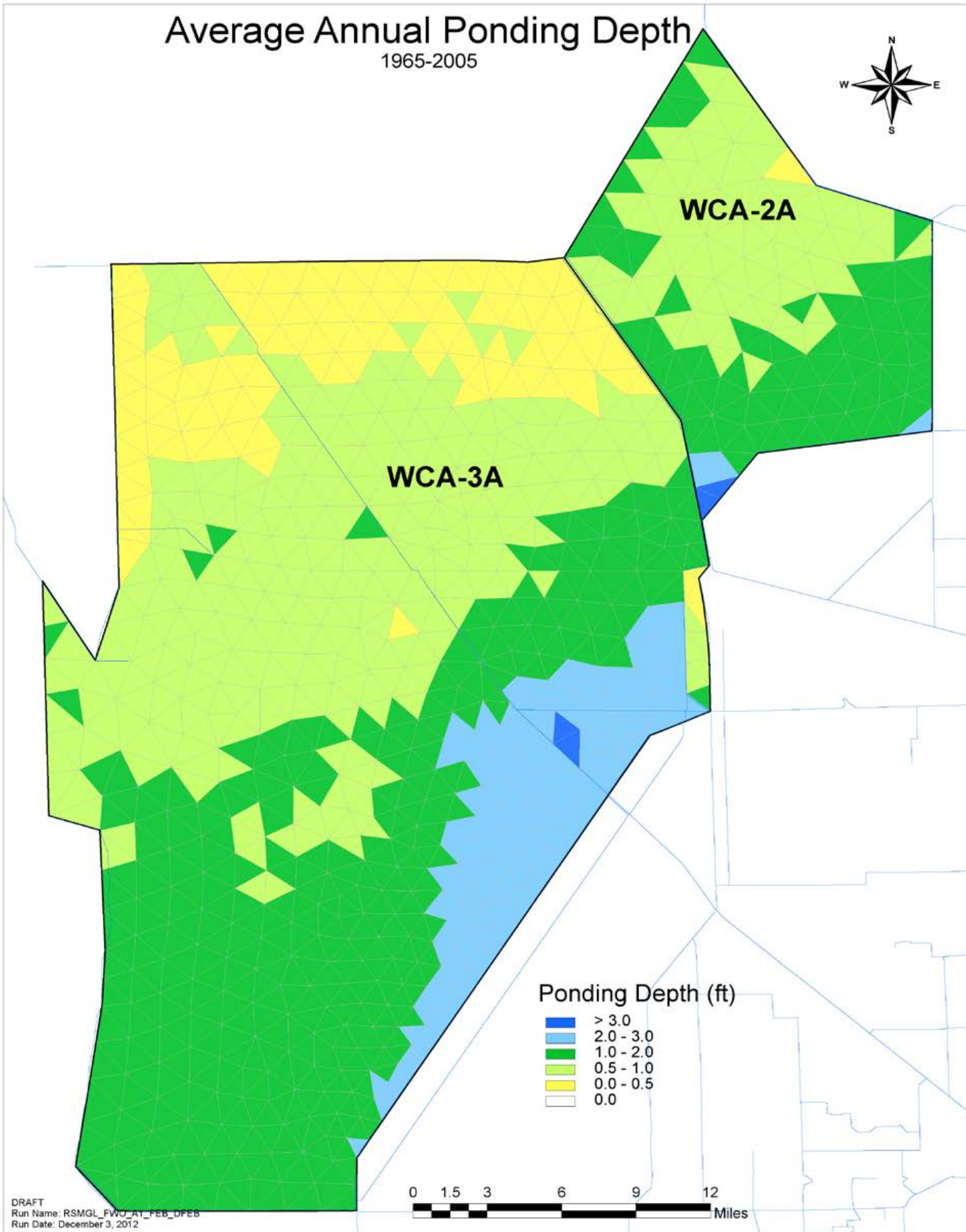


Figure 4-45 Average Annual Hydroperiod for WCA 2A and WCA 3A – Alternative 3 (Deep FEB)

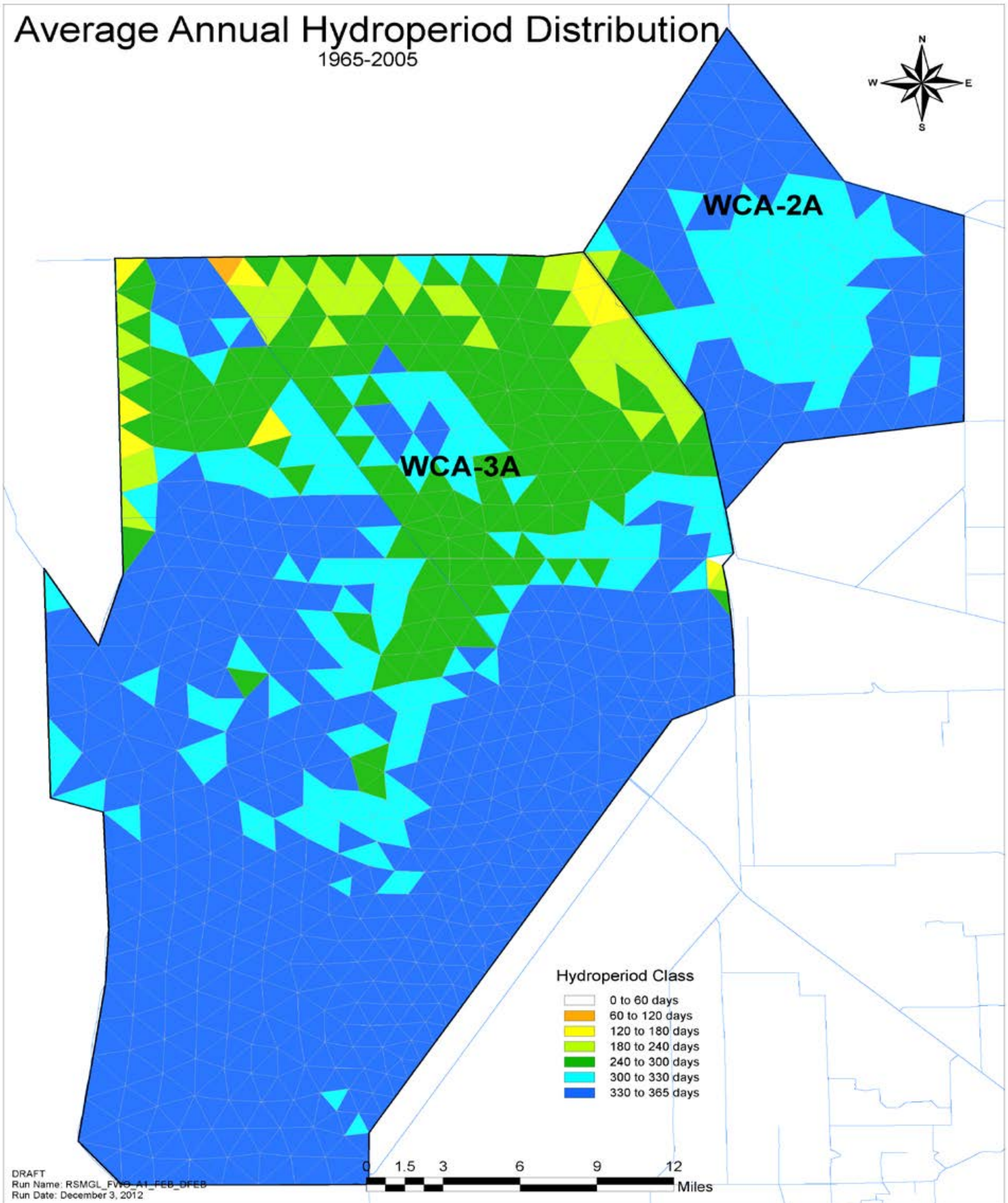
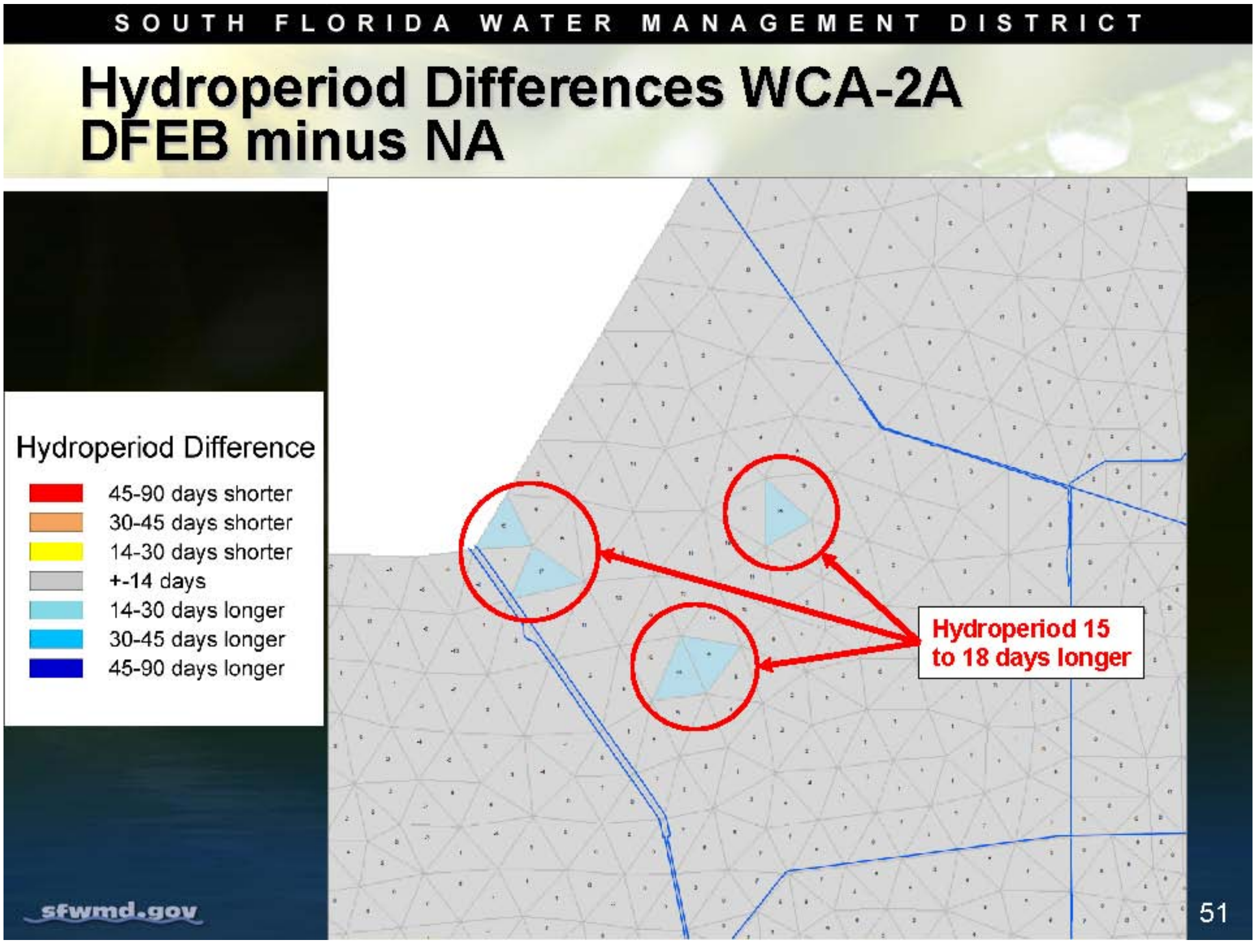


Figure 4-46 Changes in Hydroperiod in WCA 2A – Alternative 3 (Deep FEB)



Alternative 4:

For Alternative 4, there is a decrease in the total outflows including diversions (60,000 acre-feet less per year) from STA 2 as compared to the No Action Alternative, while there is also a decrease in total outflows including diversions from STA 3/4 (233,000 acre-feet less per year) (**Table 4-4**). The A-1 STA would accept 252,000 acre-feet per year of inflows while outflows and diversions are 250,000 acre-feet per year. This change is reflected in the downstream water deliveries as Alternative 4 (STA) delivers approximately 13,000 acre-feet per year less flow via the L-6 Canal from STA 2 to WCA 2A, with no change in ponding or hydroperiods as compared to the No Action Alternative (**Figure 4-49**).

Figure 4-47 Average Annual Ponding Depth for WCA 2A – Alternative 4 (STA)

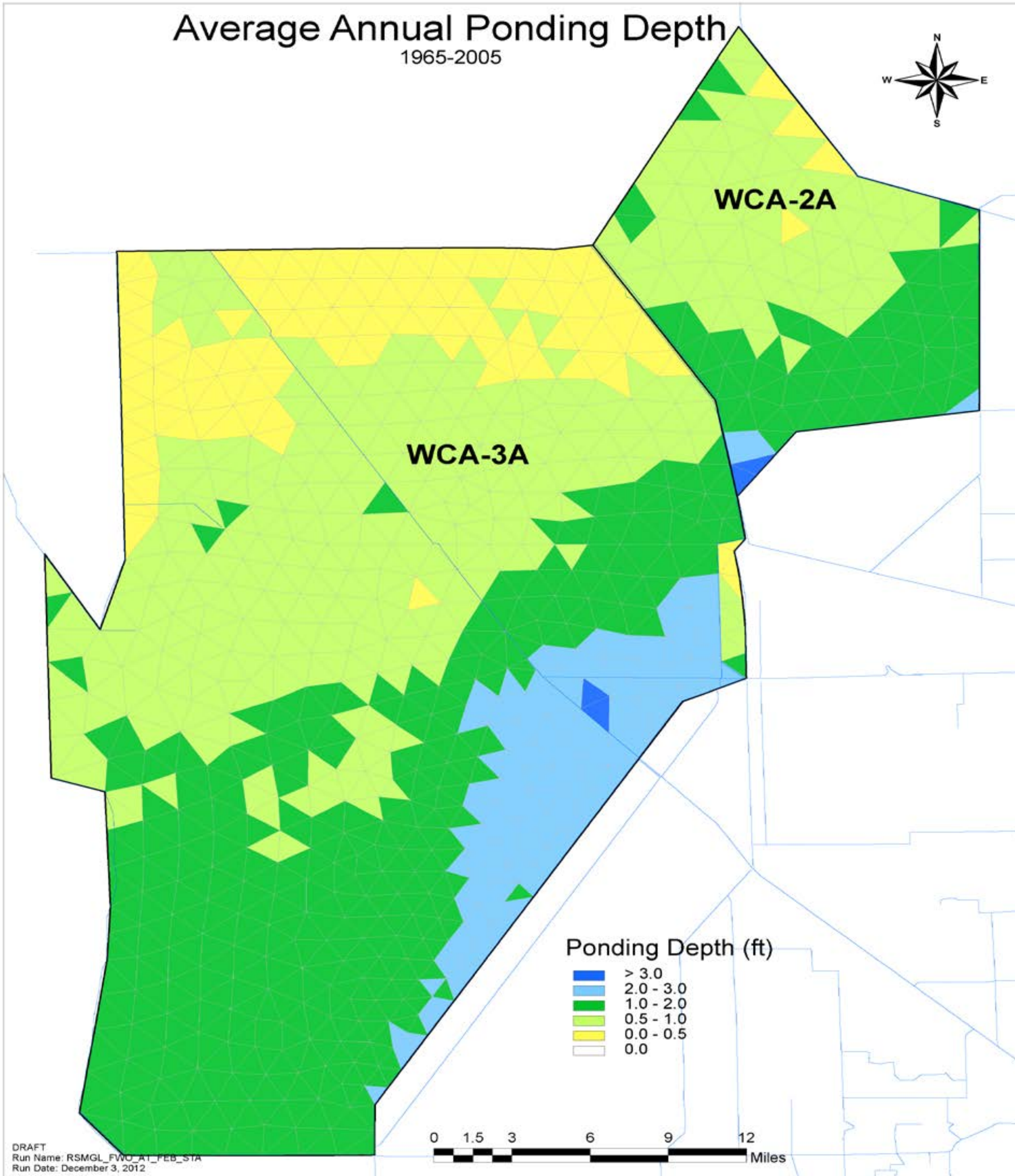


Figure 4-48 Average Annual Hydroperiod for WCA 2A and WCA 3A – Alternative 4 (STA)

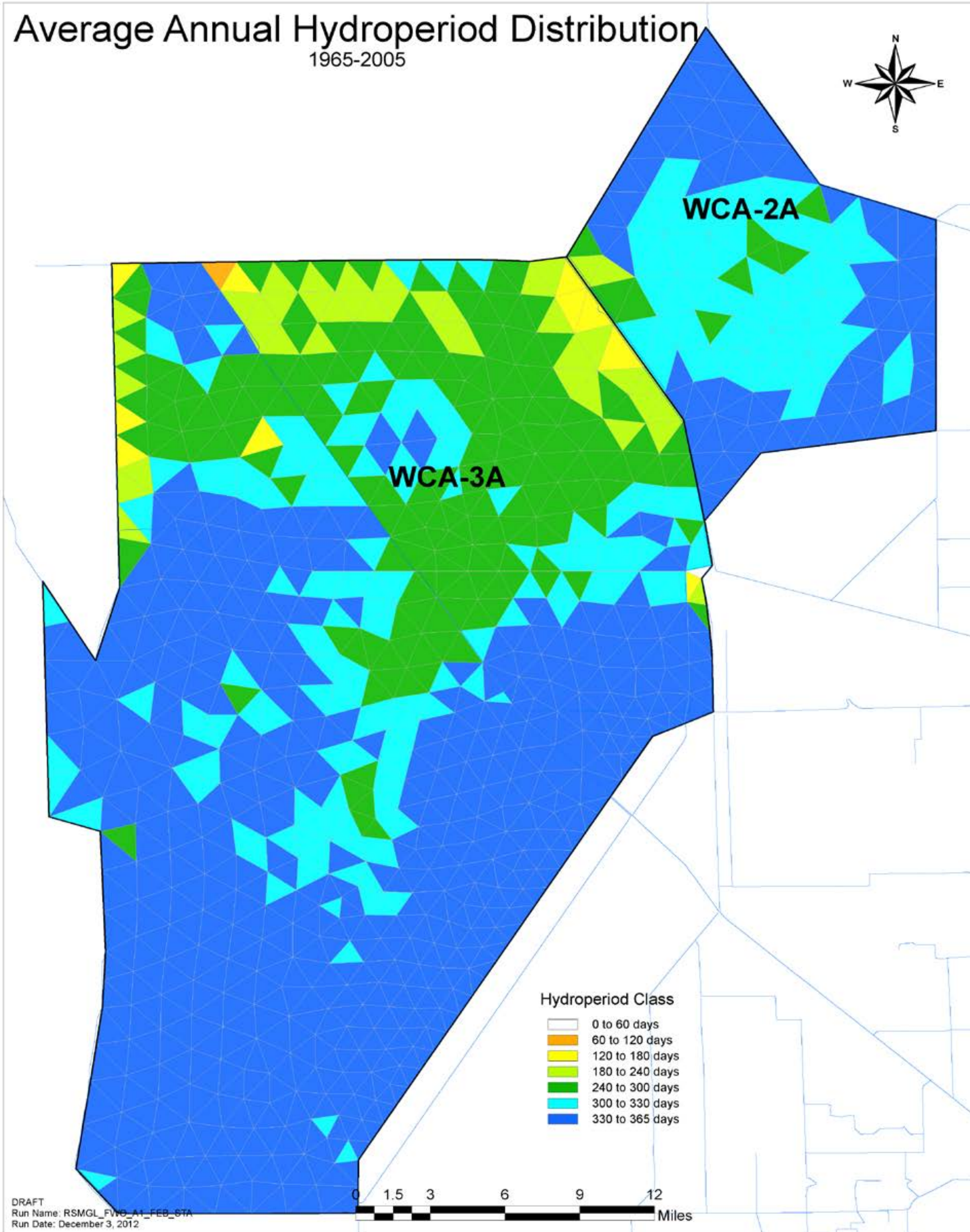
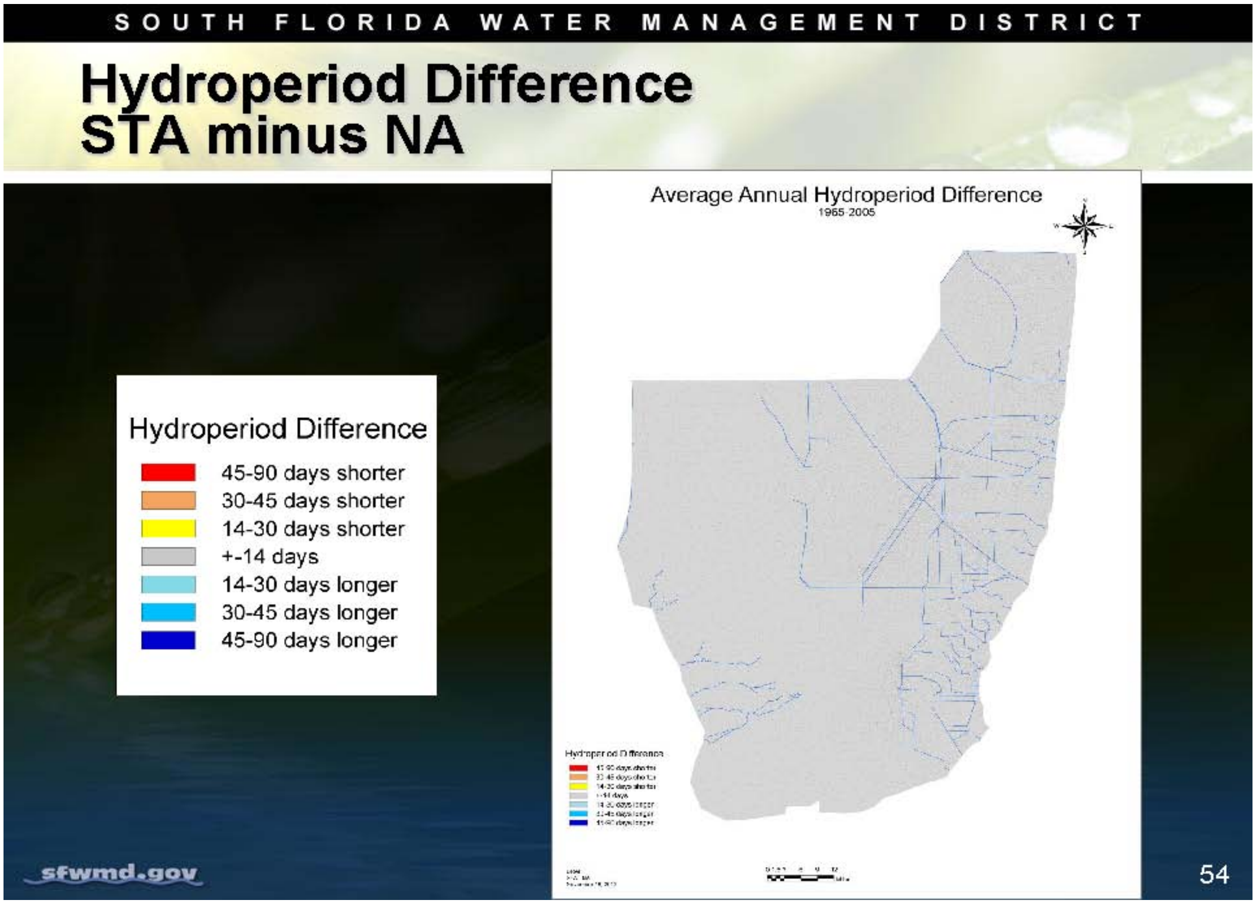


Figure 4-49 Changes in Hydroperiod in WCA 2A and WCA 3A – Alternative 4 (STA)



4.5.2.2.4 WCA 3A

WCA 3A inflows include treated flows from STA 3/4, STA 3/4 diversion flows and urban water supply flows. WCA-3A receives water from Lake Okeechobee, WCA 2 and the EAA via the North New River and Miami Canals with the majority of the inflows delivered from WCA 2A through the S-11 spillways. Another large source of water entering into WCA 3A is from STA 3/4 and STA 5, which enter through the S-8 and G-404 pump stations, and the S-150 and G-357 culverts, all of which are located at the northern boundary of WCA 3A.

Based on the results of the Glades LECSA RSM modeling, WCA 3A would receive approximately 401,000 acre-feet per year of inflows for the No Action Alternative, while Alternatives 2, 3, and 4 result in 25,000; 24,000; and 28,000 acre-feet per year less water than the No Action Alternative (**Table 4.6**). This reduction is mainly due to operating a 15,000 acre FEB or STA as compared to the No Action Alternative where the project site retains water without any discharge to the surrounding area. Performance measure graphics were generated for several gauge locations within WCA 3A and for the entire area.

Table 4-6 Average Annual Inflows in WCA 3A

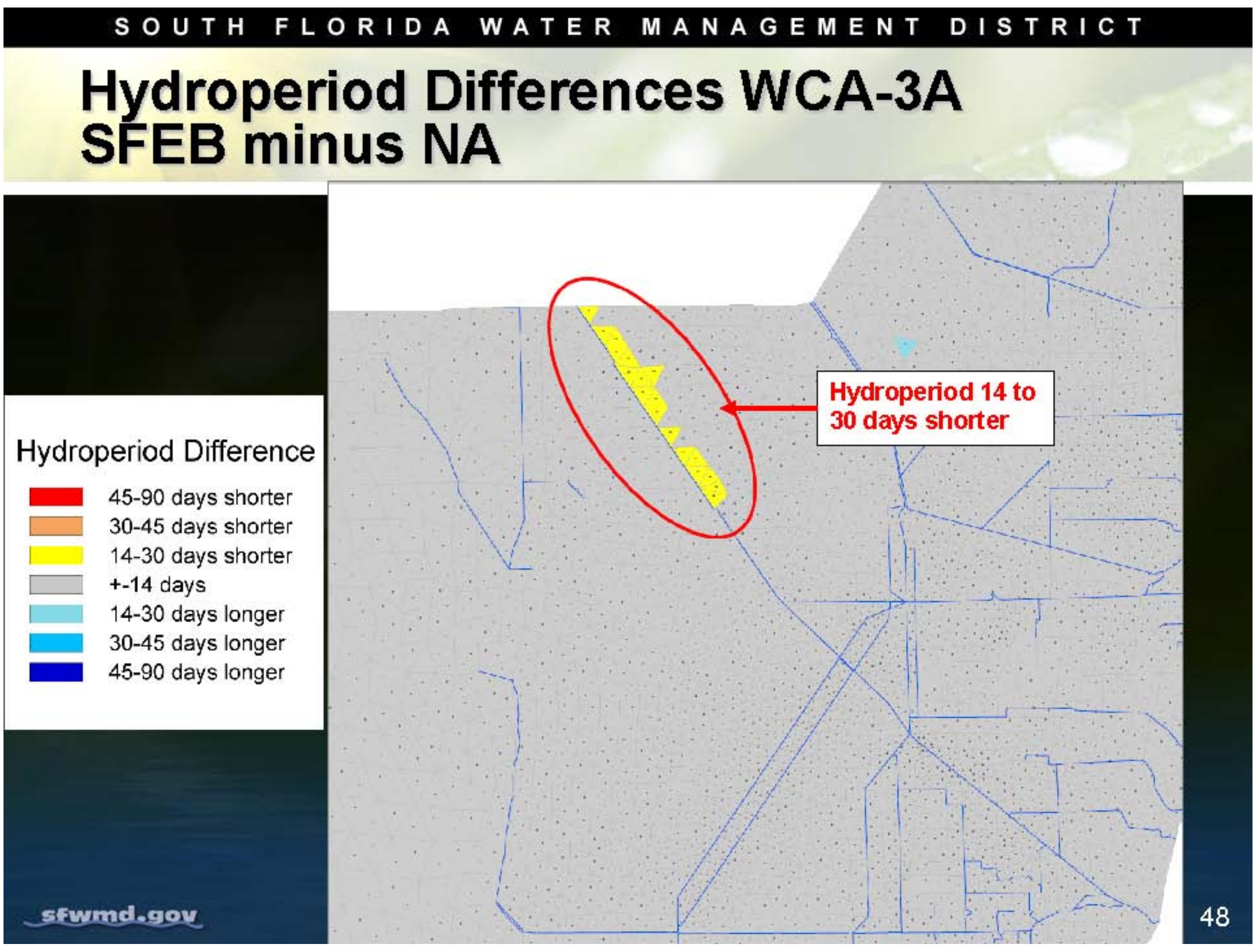
	Parameter	Average Annual Volume (acre-feet per year)			
		Alternative 1: No Action	**Alternative 2: Shallow FEB**	**Alternative 3: Deep FEB**	**Alternative 4: STA**
WCA-3A	**Inflows**	401,000	376,000	377,000	373,000

A gauge location map is provided in **Figure 4-5**. Hydrographs of daily ponding depths and duration curves of ponding depths are provided for five WCA 3A gauge locations (3A-NW, 3A-NE, 3A-3, 3A-4, and 3A-28) in **Figures 4-12 through 4-21**. **Figures 4-41, 4-42 and 4-43** provide average annual ponding depths, hydroperiod distribution and the hydroperiod difference for Alternative 2 respectively for WCA 3A. **Figures 4-44** and **4-45** provide average annual ponding depths and hydroperiod distribution for Alternative 3 respectively for WCA 3A. **Figures 4-47** and **4-48** provide average annual ponding depths and hydroperiod distribution for Alternative 4, respectively, for WCA 3A.

Alternative 2:

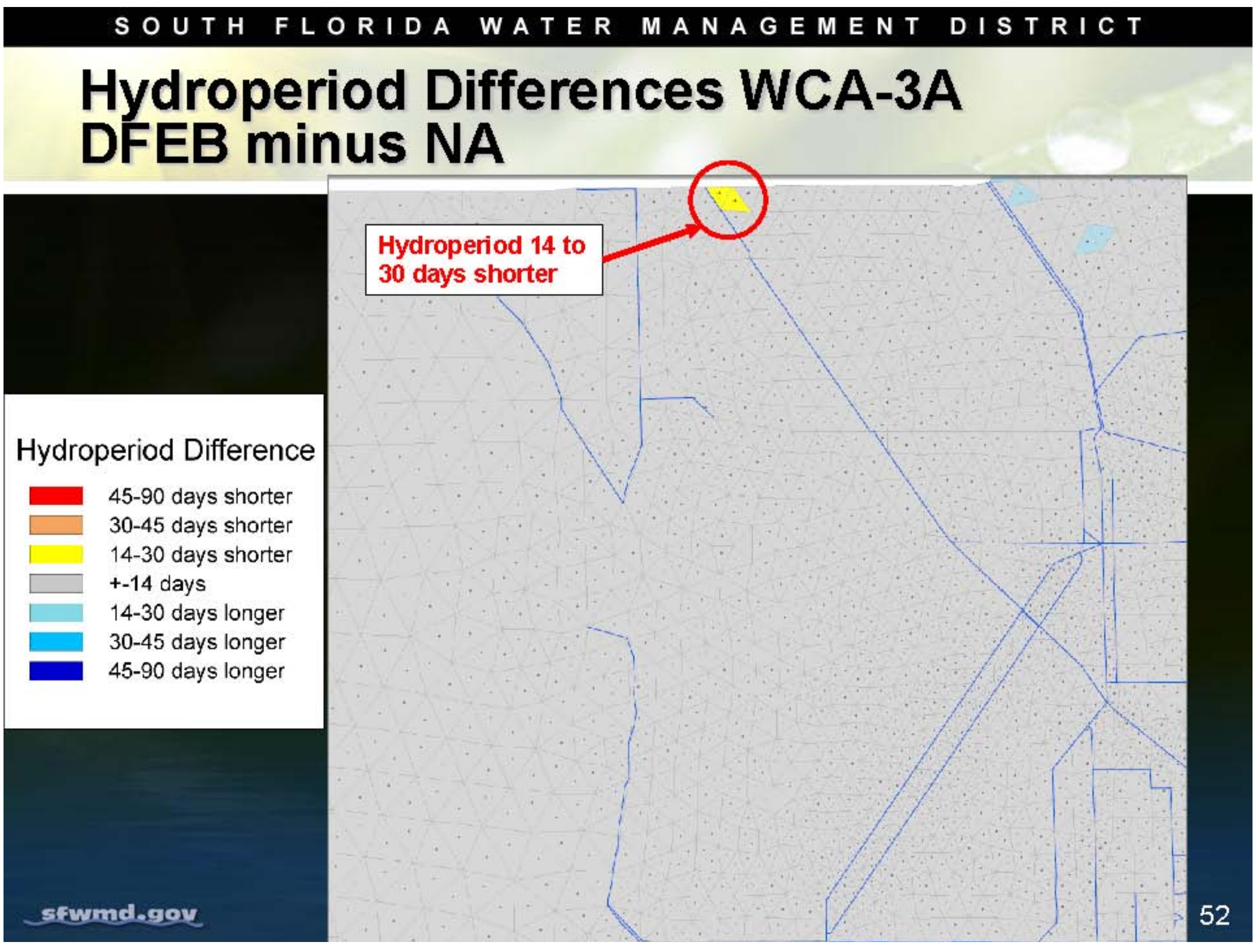
For Alternative 2, there is an increase in the total outflows including diversions (72,000 acre-feet per year) from STA 2 as compared to the No Action Alternative, while there is a decrease in total outflows from STA 3/4 (109,000 acre-feet less per year). WCA 3A receives 25,000 acre-feet per year less inflows than the No Action Alternative. This change is seen in the downstream areas as Alternative 2 (Shallow FEB) produces slightly shorter hydroperiods in an area in WCA 3A adjacent to the northern reach of the Miami Canal in comparison to the No Action Alternative. Approximately 11,000 acres of WCA 3A (2.2 percent) experience hydroperiods 14 – 30 days per year shorter than the No Action Alternative (**Figure 4-50**).

Figure 4-50 Changes in Hydroperiod in WCA 3A – Alternative 2 (Shallow FEB)



Alternative 3:
For Alternative 3 (Deep FEB), there is an increase in the total outflows including diversions (70,000 acre-feet more per year) from STA 2 as compared to the No Action Alternative, while there is a decrease in total outflows including diversions from STA 3/4 (109,000 acre-feet less per year) (**Table 4—4**). WCA 3A receives 24,000 acre-feet per year less inflows than in the No Action Alternative. This change is seen in the downstream areas as approximately 1,000 acres of WCA 3A (0.2 percent) experience hydroperiods 14 to 30 days per year shorter than the No Action Alternative (**Figure 4-51**).

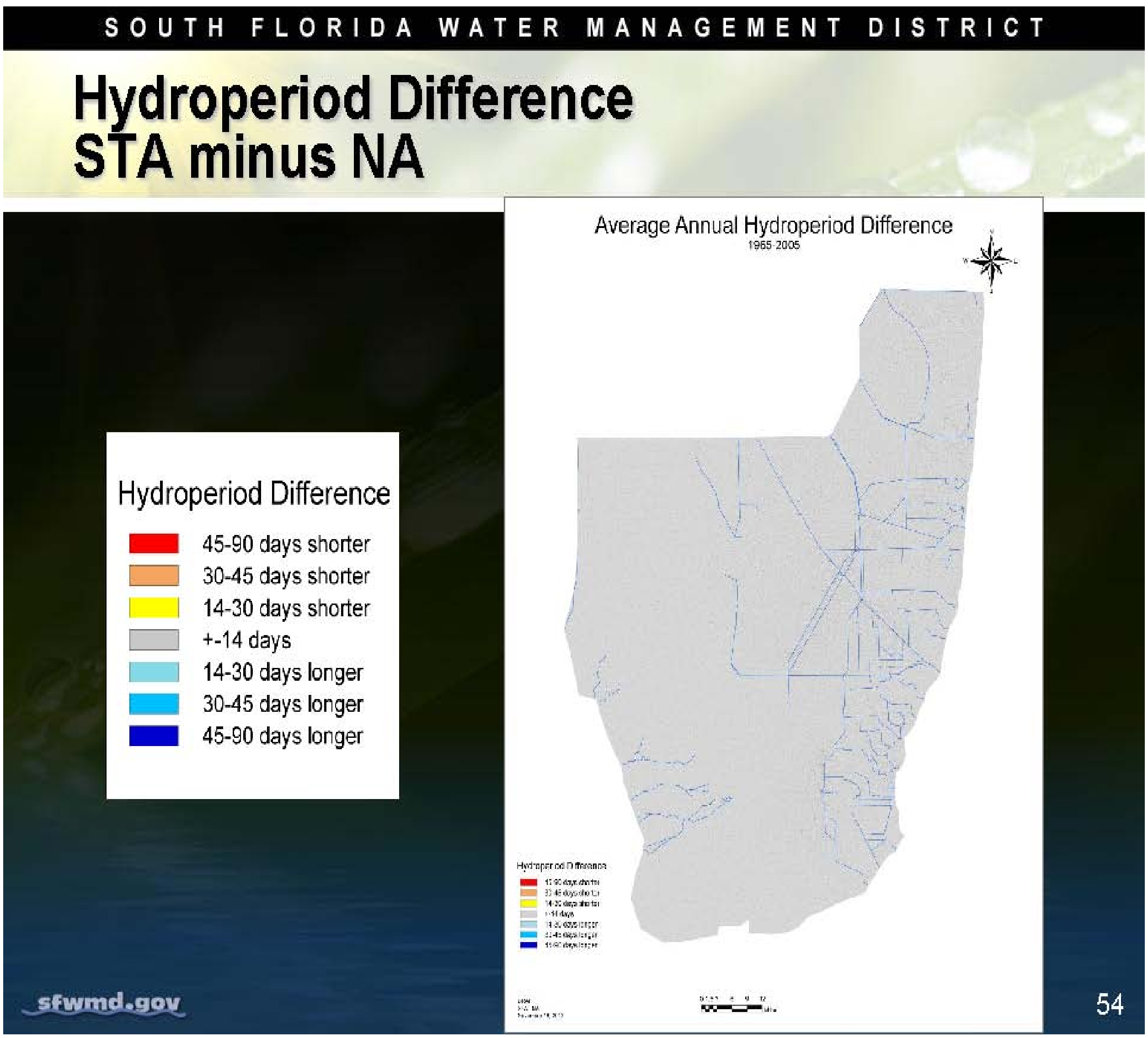
Figure 4-51 Changes in Hydroperiod in WCA 3A – Alternative 3 (Deep FEB)



Alternative 4:

For Alternative 4, there is a decrease in the total outflows including diversions (60,000 acre-feet less per year) from STA 2 as compared to the No Action Alternative, and a decrease in total outflows including diversions from STA 3/4 (223,000 acre-feet less per year). This is because the A-1 STA would accept 252,000 acre-feet per year of inflows and 250,000 acre-feet per year of outflows. WCA 3A receives 28,000 acre-feet per year less inflows than No Action Alternative. Alternative 4 (STA) produces ponding and hydroperiods in WCA 3A that are very similar to the No Action Alternative as there are no observed differences (**Figure 4-52**).

Figure 4-52 Changes in Hydroperiod in WCA 3A – Alternative 4 (STA)



4.5.2.2.5 Holey Land Wildlife Management Area

No impacts to the surface water hydrology are anticipated to occur for the Action Alternatives since the action alternatives would not increase or decrease surface water in the Holey Land. As a result, no changes to Holey Land ponding depths are anticipated to occur.

4.5.3 GROUNDWATER HYDROLOGY

4.5.3.1 No Action Alternative

4.5.3.1.1 Project Site

The two principal aquifers in and around the project site – the surficial aquifer system, and the Floridan aquifer system – would not be affected by the No Action Alternative. Under the No Action Alternative, the groundwater hydrology in and around the project site would remain as it is today, as described in Chapter 3. The groundwater hydrology of the STAs, the WCAs, and Holey Land would remain as it is currently.

4.5.3.2 Action Alternatives

The two principal aquifers in and around the project site – the surficial aquifer system, and the Floridan aquifer system – would be minimally, if at all, affected by the Action Alternatives. The Floridan aquifer system is divided into the Upper Floridan and Lower Floridan, by an intermediate confining unit, which restricts communication between these two layers. Therefore, the Lower Floridan would not be affected by any of the Action Alternatives. Alternatives 2, 3, and 4 would result in the construction and operation of a Shallow FEB, Deep FEB or STA that may inundate 15,000 acres with water depths ranging from approximately 1 to 12.5 feet. Under these conditions, water within the project site would be in direct contact with the groundwater through the surface soils and may be lost to the surficial aquifer system. However, due to the proposed seepage collection and return systems proposed for all of the Action Alternatives, the contribution of seepage that would occur would have a minimal effect on groundwater. Expected contributions to seepage from Alternative 2, 3 and 4 are expected to be equivalent.

No impacts to the groundwater hydrology of the STAs, WCAs, or Holey Land are anticipated to occur for the Action Alternatives as operational changes are not proposed and water levels within the STAs would remain approximately the same as described in Chapter 3.

4.5.4 STA PHOSPHORUS REMOVAL

4.5.4.1 No Action Alternative

Under the No Action Alternative, STA 2 and STA 3/4 would continue to experience dry-outs. Between Water Years 2002 and 2012, STA 2 (which became operational in WY2000) experienced dryout conditions in at least five (5) water years, with approximate durations ranging from 1 to 5 months. STA 3/4, which became operational in WY2004, experienced dryout conditions one time since Water Year 2005, with a duration of less than one month. If similar weather conditions occur, it is anticipated that similar frequency of dry outs would occur in the future.

4.5.4.2 Action Alternatives

The primary objective of the Action Alternatives is to attenuate and temporarily store peak stormwater flows to assist STA 2 and STA 3/4 with the achievement of the WQBEL. Minimizing the potential for STA dryout is an additional benefit. The ability of DMSTA to accurately predict the duration and severity of STA dryout is limited. One assumption in the DMSTA modeling and STA operation is that the treatment cell is not allowed to dryout. Therefore, the DMSTA results do not quantify the number of dryout events simulated to be eliminated. In general, as additional STA acreage is added (as in Alternative 4), the potential risk of STA dryout, and associated impacts to phosphorus removal performance within existing and new STAs, increases, whereas, when additional storage is added (as in Alternative 2 and 3), the potential for dryout within existing STAs decreases.

Additionally, the dryout within STA 3/4 that occurred in 2011 may not have been avoided with the Action Alternatives in place due to the hydrologic conditions that occurred during early 2011. However, the damaging conditions that resulted from the rapid re-filling of STA 3/4 would have likely been prevented, as this is the type of event that an FEB (Alternatives 2 and 3) is intended to address. The rapid re-filling of STA 3/4 resulted in peat pop-ups, rapid flux of phosphorus into the water column and overwhelming stress on the vegetative communities within the STA. With the FEB Alternatives (Alternative 2 and 3) in place, stormwater flows would have been directed first to the FEB for storage and attenuation, and then distributed to STA 3/4, ultimately providing short- and long-term performance benefit to the STA.

Florida's Everglades total phosphorus criterion rule specifies a definition of impacted as being where soil TP exceeds 500 milligrams TP per kilogram of soil; therefore, if the TP concentrations in the soils are below 500 milligrams per kilograms, these soils would be considered unimpacted. Lower phosphorus concentrations discharged from STA 2 and STA 3/4 would reduce the rate of soil phosphorus accumulation in the WCA soils. Over time, reductions in soil total phosphorus will help facilitate the restoration of impacted areas near the inflow points to WCA 2A and WCA 3A, creating conditions more conducive to historic Everglades vegetation communities.

4.6 WATER QUALITY

The water quality (phosphorus) modeling of EIS alternatives was conducted using DMSTA. Average annual flow volumes and TP loads and TP concentrations summarized by source basin are provided in **Table 4-7**. Water quality improvements (i.e. reductions in TP concentrations) are anticipated to occur such that both STA 3/4 and STA 2 are projected to discharge at the WQBEL with Alternatives 2, 3, and 4. These improvements in STA discharges would result in improvements at WCA 2A and WCA 3A inflows which would subsequently lead to improvements in water quality within WCA 2A and WCA 3A. Each STA is required to discharge at the WQBEL, which is based on a long-term discharge of 13 ppb flow-weighted (Section 1.3.1.2), after all the corrective actions identified in the consent orders associated with the NMDES and EFA permits have been completed in 2025. DMSTA projections of STA outflow concentration, such as those in **Table 4-8**, are interpreted in this context. Modeling uncertainty for DMSTA results is estimated at + or - 15% of the predicted long-term flow-weighted mean for each STA (USEPA 2010, Attachment H), without accounting for uncertainty in the assumed future flows and loads.

Table 4-7 Source Basin Flow Volumes and Total Phosphorus Loads and Concentrations

Source Basins	Average Annual Flow Volume (acre-feet per year)	Total Phosphorus Load (metric tons per year)	Total Phosphorus Concentration (ppb)
S-5A	44,500 [1]	11.7	213
S-6	181,400	24.8	111
S-7	263,900 [2]	31.9 [3]	98
S-8	218,400	22.5	83
East Shore Water Control District and 715 Farms (Closter Farms)	22,700	3.7	132
South Florida Conservancy District	19,100	2.5	108
South Shore Drainage District	11,700	1.7	116
C-139 (via C136)	14,700	2.8	154
Lake Okeechobee	58,300	10.4	145

(Regulatory Releases)			
Total	834,700	112.0	109

Notes:

1. Assumes runoff reduction resulting from the future 6,500-acre STA-1W expansion in the S-5A Basin.
2. S-7 runoff is reduced to 231,000 acre-feet per year for Action Alternatives due to runoff no longer occurring from the project site.
3. S-7 total phosphorus load is reduced to 28.4 metric tons per year for the Action Alternatives due to runoff no longer occurring from the project site.

4.6.1 NO ACTION ALTERNATIVE

4.6.1.1 Project Site

Under the No Action Alternative, and if the area remains fallow, the water quality of the project site would likely remain as it is today as described in Section 3.6. The project site would continue to experience periods of dryout, which would lead to additional soil oxidation and release of nutrients upon rewetting. If the lands are converted back to active agriculture, it is expected that the stormwater runoff from the project site would likely contain relatively high levels of nutrients (mainly phosphorus and nitrogen from particulate matter and fertilizers) as with other agricultural lands in the EAA, though farming practices would follow best management practices in place for the area.

4.6.1.2 STA 3/4 and STA 2

Under the No Action Alternative, STA 2 and STA 3/4 would continue to receive peak stormwater flows and continue to experience dryout conditions that occur as a result of extreme hydrologic conditions that exist in south Florida. High flows resulting from storm events would likely continue to result in water depth durations that are longer and deeper than optimal, excessive hydraulic loading rates and phosphorus loading rates to the STAs, or diversion of untreated water around the STAs into the EPA. Extreme dry conditions would likely continue to result in periods of dryout causing additional soil oxidation and nutrient release. As a result, achievement of the WQBEL at discharges from both STAs would likely not occur. For the No Action Alternative, the outflow TP concentration for STA 2 (including Compartment B) is projected to be 13 ppb, based on the results of DMSTA modeling. This improvement, compared to the information provided in Section 3.6.2 (STA 2 historic outflow of 22 ppb, **Table 3-1**), is mainly due to the addition of 7,000 acres of treatment area (Compartment B) in 2012. The DMSTA-simulated outflow TP concentration of STA 3/4 is 18 ppb for the No Action Alternative, which is consistent with the information provided in Section 3.6.2. Under the No Action Alternative, the WQBEL would not be met at STA 3/4. **Table 4-8** provides DMSTA-simulated inflow and outflow volumes, inflow and outflow TP loads and inflow and outflow TP concentrations.

Table 4-8 STA 3/4 and STA 2 Flows, TP Loads and TP Concentrations

	Parameter	Alternative 1: No Action
STA 2	Inflow Volume (acre-feet per year)	301,000
	Outflow Volume (acre-feet per year)	307,000
	Inflow TP Load (metric tons per year)	46.2
	Outflow TP Load (metric tons per year)	4.6
	Inflow TP Concentration (ppb)	124
	Outflow TP Concentration (ppb) [1]	13
STA 3/4	Inflow Volume (acre-feet per year)	504,000
	Outflow Volume (acre-feet per year)	495,000
	Inflow TP Load (metric tons per year)	62.0
	Outflow TP Load (metric tons per year)	11.2
	Inflow TP Concentration (ppb)	100
	Outflow TP Concentration (ppb) [1]	18

Notes:
1. Due to the uncertainty associated with DMSTA-simulated low level annual concentrations, annual values less than 12 ppb were replaced with a value of 12 ppb.

4.6.1.3 WCA 2A

Under the No Action Alternative, the water quality of WCA 2A would improve from the conditions described in Chapter 3, due to the phosphorus reductions that would occur with the additional 7,000 acres of treatment area at STA 2 (Compartment B). Compartment B construction was completed in December 2011 and was flow capable in April 2012. Water quality improvements at the STA 2 discharge may be seen as early as in Water Year (WY) 2012. **Table 4-9** provides the inflow volumes, inflow TP load and inflow TP concentrations for WCA 2A from STA 2 and STA 3/4 for the No Action Alternative.

Table 4-9 WCA 2A Inflow Volumes, TP Loads and TP Concentrations from STA 2 and STA 3/4

	Parameter	Alternative 1: No Action
WCA 2A	Inflow Volume (acre-feet per year)	436,000
	Inflow TP Load (metric tons per year)	8.6
	Inflow TP Concentration (ppb)	16

4.6.1.4 WCA 3A

Failure to attain the WQBEL at the STA 3/4 discharge under the No Action Alternative is expected to result in the continued discharge of nutrient-laden waters and further degradation of water quality conditions in WCA 3A. **Table 4-10** provides inflow volumes, inflow TP load and inflow TP concentrations for WCA 3A from STA 3/4 for the No Action Alternative.

Table 4-10 WCA 3A Inflow Volumes, TP Loads and TP Concentrations

	Parameter	Alternative 1: No Action
WCA 3A	Inflow Volume (acre-feet per year)	341,000
	Inflow TP Load (metric tons per year)	6.9
	Inflow TP Concentration (ppb)	17

4.6.1.5 Holey Land Wildlife Management Area

Under the No Action Alternative, the water quality of Holey Land would likely remain as it is today and as described in Chapter 3.

4.6.2 ACTION ALTERNATIVES

4.6.2.1 Project Site

Because the shallow FEB and the STA alternatives both operate by channeling water through shallow marshes, these two alternatives would reduce both TP loads and concentrations on the project site. The STA most efficiently removes the TP loads and concentrations as it would contain managed cells with both emergent and submerged wetland vegetation cells. The shallow FEB also provides benefits of phosphorus removal; however, its operation is not designed to optimize phosphorus removal on the project site. Therefore, the ability to remove phosphorus on the project site is limited for the Shallow FEB. The Deep FEB would not contain submerged or emergent wetland plant species that remove phosphorus and therefore, would not be expected to provide the reductions in phosphorus loads and concentrations that would be provided by the Shallow FEB and STA alternatives. A summary of DMSTA-simulated project site inflow and outflow volumes, inflow and outflow TP loads and inflow and outflow TP concentrations for all alternatives is provided in **Table 4-11**.

Table 4-11 Project Site Flows, TP Loads and TP Concentrations

Parameter	Alternative 1: No Action	Alternative 2: Shallow FEB	Alternative 3: Deep FEB	Alternative 4: STA
Inflow Volume (acre-feet per year)	NA	274,000	336,000	252,000

Outflow Volume (acre-feet per year)	NA	272,000	333,000	245,000
Inflow TP Load (metric tons per year)	NA	31.9	39.0	31.3
Outflow TP Load (metric tons per year)	NA	7.9	41.0	2.8
Inflow TP Concentration (ppb)	NA	94	94	100
Outflow TP Concentration (ppb) [1]	NA	44	100	12

Notes:
1. Due to the uncertainty associated with DMSTA-simulated low level annual concentrations, annual values less than 12 ppb were replaced with a value of 12 ppb.

4.6.2.2 STA 2 and STA 3/4

A summary of STA 2 and STA 3/4 inflow and outflow volumes, inflow and outflow TP loads and inflow and outflow TP concentrations for all alternatives is shown in **Table 4-12**.

Table 4-12. STA 3/4 and STA 2 Flows, TP Loads and TP Concentrations

	Parameter	Alternative 1: No Action	Alternative 2: Shallow FEB	Alternative 3: Deep FEB	Alternative 4: STA
STA 2	Inflow Volume (acre-feet per year)	301,000	387,000	386,000	253,000
	Outflow Volume (acre-feet per year)	307,000	391,000	389,000	259,000
	Inflow TP Load (metric tons per year)	46.2	53.2	57.1	40.6
	Outflow TP Load (metric tons per year)	4.6	6.0	5.5	3.4
	Inflow TP Concentration (ppb)	124	112	120	130
	Outflow TP Concentration (ppb) [1]	13	13	12	12
STA 3/4	Inflow Volume (acre-feet per year)	504,000	401,000	407,000	275,000

	Outflow Volume (acre-feet per year)	495,000	392,000	397,000	269,000
	Inflow TP Load (metric tons per year)	62.0	29.4	52.1	34.1
	Outflow TP Load (metric tons per year)	11.2	5.6	5.6	3.5
	Inflow TP Concentration (ppb)	100	59	104	100
	Outflow TP Concentration (ppb) [1]	18	13	13	12

Notes:
1. Due to the uncertainty associated with DMSTA-simulated low level annual concentrations, annual values less than 12 ppb were replaced with a value of 12 ppb.

The project purpose is to meet the WQBEL in water at the STA 2 and STA 3/4 discharge points as it enters into the EPA. If the WQBEL is met at both STAs, and the STAs are able to adequately treat wet season flows, then future loading of excess phosphorus into the Everglades will be prevented. The WQBEL applied at the STA discharge is based on 13 ppb long-term as a flow weighted mean (which is equivalent to the 10 ppb long-term geometric mean criterion in the EPA marsh). The DMSTA modeling presented is interpreted against the objective of meeting the WQBEL: 13 ppb or below for STAs 2 and 3/4. With the addition of 7,000 acres of treatment area at STA 2 as a result of Compartment B, as modeled all four alternatives would meet the WQBEL at STA 2. However, the WQBEL is required to be met for both STA 2 and STA 3/4. All of the three Action Alternatives are projected to meet the WQBEL for both STAs.

4.6.2.3 WCA 2A

A summary of WCA 2A inflow volumes, inflow and outflow TP loads and inflow and outflow TP concentrations for all Action Alternatives is shown in **Table 4-13**. For Alternative 2, the TP concentration of WCA 2A inflows decreases by 3 ppb and the TP load in WCA 2A inflows decreases by 1.4 metric tons per year (16 percent) when compared to the No Action Alternative. For Alternative 3, the TP concentration of WCA 2A inflows decreases by 4 ppb and the TP load of WCA 2A inflows decrease by 2.2 metric tons per year (26 percent) when compared to the No Action Alternative. For Alternative 4, the TP concentration of WCA 2A inflows also decreases by 4 ppb and the TP load of WCA 2A inflows decreases by 2.3 metric tons per year (27 percent) when compared to the No Action Alternative.

Table 4-13. WCA 2A Inflow Volumes, TP Loads and TP Concentrations

	Parameter	Alternative 1: No Action	Alternative 2: Shallow FEB	Alternative 3: Deep FEB	Alternative 4: STA
WCA 2A	Inflow Volume (acre-feet per year)	436,000	437,000	434,000	435,000
	Inflow TP Load (metric tons per year)	8.6	7.2	6.4	6.3
	Inflow TP Concentration (ppb)	16	13	12	12

Notes:
1. Due to the uncertainty associated with DMSTA-simulated low level annual concentrations, annual values less than 12 ppb were replaced with a value of 12 ppb.

4.6.2.4 WCA 3A

For all three Action Alternatives, the water quality of WCA 3A would improve as compared to the No Action Alternative, since the phosphorus concentration of WCA 3A inflows is reduced and STA 3/4 is projected to discharge at 13 ppb. **Table 4-14** provides a summary of WCA 3A inflow volumes, inflow and outflow TP loads and inflow and outflow TP concentrations from STA 3/4 for all alternatives. For Alternative 2, the TP concentration of WCA 3A inflows decreases by 5 ppb and the TP load of WCA 3A inflows decreases by 2.1 metric tons per year (30 percent) when compared to the No Action Alternative. For Alternative 3, the TP concentration of WCA 3A inflows also decreases by 5 ppb and the TP load of WCA 3A inflows decreases by 2.1 metric tons per year (30 percent) when compared to the No Action Alternative. For Alternative 4, the TP concentration of WCA 3A inflows also decreases by 5 ppb and the TP load of WCA 3A inflows decreases by 2.2 metric tons per year (32 percent) when compared to the No Action Alternative.

Table 4-14. WCA 3A Inflow Volumes, TP Loads and TP Concentrations from STA 3/4

	Parameter	Alternative 1: No Action	Alternative 2: Shallow FEB	Alternative 3: Deep FEB	Alternative 4: STA
WCA 3A	Inflow Volume (acre-feet per year)	341,000	321,000	327,000	318,000
	Inflow TP Load (metric tons per year)	6.9	4.8	4.8	4.7
	Inflow TP Concentration (ppb)	17	12	12	12

Notes:

1. Due to the uncertainty associated with DMSTA-simulated low level annual concentrations, annual values less than 12 ppb were replaced with a value of 12 ppb.

4.6.2.5 Holey Land Wildlife Management Area

No water quality impacts to the Holey Land Wildlife Management Area are anticipated to occur for the Action Alternatives.

4.7 VEGETATION

4.7.1 GENERAL VEGETATION

4.7.1.1 No Action Alternative

4.7.1.1.1 Project Site

The vegetation at the site would continue to be dominated by weedy and invasive species. The 187 acres of higher quality depressional wetlands that were present in 2005 are now in a degraded condition with 90% nuisance and exotic species such as Elephant grass (*Pennisetum purpureum*) and castor bean. A continued expansion of these nuisance species and degradation of wetlands at the site would be expected if the site were to remain fallow. If agricultural activities would resume, the existing vegetation on the site would be replaced with agricultural plants (crop species such as sugar cane or sod farm).

4.7.1.1.2 STA 2 and STA 3/4

Under the No Action Alternative, the vegetative community types in STA 2 and STA 3/4, which contains a mixture of EAV (*Typha* spp.) and SAV (*Chara* and *Najas*), would not change. Under the No Action alternative, impacts to vegetation resulting from increased hydraulic and nutrient loading rates and extended dry-out periods would occur as described in Section 3.7.2.

4.7.1.1.3 WCA 2A and WCA 3A

It is anticipated the No Action Alternative would allow the nuisance cattail vegetation to continue to dominate and proliferate in the areas within the phosphorus enrichment gradients downstream of inflow points as described in Chapter 3. In WCA 2A, cattail coverage increased from 13,517 acres in 1991 to 23,010 acres in 1995 and to 29,178 acres in 2003 as determined by aerial imagery interpretation. In WCA 3, cattail coverage increased from 49,102 acres in 1995 to 79,936 acres in 2004. The aerial extent of cattail expansion may continue to increase; however with the recent expanded treatment area of STA 2, the rate of expansion in WCA 2A may be reduced. This is indicated by a prior vegetation mapping effort in which the average expansion was reduced from 2,375 acres per year during the first period to 771 acres per year for the second. In the vegetation transects of WCA 2A, for the past few water years, cattail has dominated the sites nearest the northern G-339 discharge point with a mixture of cattail and sawgrass at 0.6 miles (1 kilometer) downstream to sawgrass dominant sites 1.2 miles (2 kilometers) downstream or greater.

4.7.1.1.4 Holey Land Wildlife Management Area

No change to the vegetation in community structure in the Holey Land is expected under the No Action Alternative.

4.7.1.2 Action Alternatives

4.7.1.2.1 Project Site

Alternative 2 (Shallow FEB)

Hydrologic conditions at the site with the Shallow FEB, coupled with vegetation management, would favor the establishment of native marsh vegetation. The primary goal of vegetation management is to establish and maintain healthy EAV dominated communities, a community of plant species that have roots anchored to the bottom of the marsh and leaves that grow up through the water and emerge above the surface. The vegetative community structure that is anticipated within the A-1 Shallow FEB includes EAV with native plant species such as sawgrass (*Cladium jamaicense*), Carolina willow (*Salix caroliniana*), bulrush (*Scirpus californicus*), pickerel weed (*Pontederia cordata*), duck potato (*Sagittaria lancifollia*), muskgrass (*Chara* sp.), Illinois pondweed (*Potamogeton illinoensis*), coontail (*Ceratophyllum demersum*), and cattail (*Typha* spp.). The wetlands created would be protected from further development, managed to eliminate undesirable vegetation, and would provide improved functionality in perpetuity for the system. In addition, it is assumed in the DMSTA modeling that this EAV wetland vegetation would provide a greater phosphorus removal benefit than a Deep FEB.

Alternative 3 (Deep FEB)

Due to the variable hydrology of the Deep FEB (approximately 1 foot to 12 feet) and anticipated water depth above 4 feet for 30 percent of the time, it is not anticipated that this feature would support stable vegetative communities. The Deep FEB would act more like a reservoir due to the inability for a stable plant community to develop.

Alternative 4 (STA)

Under the STA alternative the project site would support vegetation similar to what is found in the existing STAs 2 and 3/4 with both EAV and SAV. The dominant SAV species include *Chara*, which is commonly called muskgrass, and *Najas*, which is water-nymph. The dominant EAV is cattail. Existing undesirable vegetation at the site would be replaced with vegetation similar to what is found in existing STAs as per the SFWMD planting guidelines for STAs.

4.7.1.2.2 STA 2 and STA 3/4

Alternative 2 (Shallow FEB) and Alternative 3 (Deep FEB)

With the Shallow and Deep FEB alternatives, the impacts to vegetation from heavy hydraulic loading rates and extended dry-out periods would be reduced. The FEB would attenuate stormwater runoff from the basins and deliver it in a more advantegous manner to STA 2 and STA 3/4. This steadier flow would help optimize the performance of the existing STAs.

Alternative 4 (STA)

The STA alternative would lessen impacts from heavy hydraulic loading rates, although to a lesser extent than either the proposed FEB alternatives. Extended dry-out periods with STAs 2 and 3/4 are anticipated to remain as described in Chapter 3 and the phosphorus removal efficiency of these STAs reduced as a result.

4.7.1.2.3 WCA 2A and WCA 3A

Alternative 2 (Shallow FEB)

The Shallow FEB showed reductions in phosphorus concentrations in inflows entering WCA 2A and WCA 3A from the EAA. The expected result is a reduction in cattail proliferation and expansion within the areas downstream of inflow point S-7 in WCA 2A, and inflow points from the S-11 spillways and S-8 and G-404 pump structures in WCA 3A. Also, open water areas may increase, providing habitat for the periphyton communities that are essential to the Everglades. These reductions represent an incremental step towards achieving the overall EPA marsh criterion of 10 ppb, which would help to restore the natural balance of native Everglades flora and fauna.

Changes to vegetation from the slightly altered hydroperiods in isolated areas of WCA 2A and WCA 3A are not anticipated. In WCA 2A, the RSM model predicted slightly greater hydroperiods (17 days longer) in sparse areas in northwest WCA 2A. In WCA 3A the RSM model predicted slightly shorter hydroperiods (14-30 days less) in already disturbed areas along a narrow stretch north of the Miami Canal in WCA 3A. Despite this slight decrease in hydroperiod, there is no difference in hydroperiod classes in this area between the no action and the shallow FEB.

Hydroperiod classes in the affected area range primarily from 240 to 300 days (8 to 10 months), followed by a few cells at 180 to 240 days (6 to 8 months), and two shorter hydroperiod cells at the very northeast portion of the affected area. An edge effect from the Miami Canal in this area is apparent and the majority of this area is already heavily impacted by cattails with shrubs.

Alternative 3 (Deep FEB)

Anticipated vegetative responses from reductions in phosphorus are equivalent to those described for the Shallow FEB alternative above. The RSM model predicted very minor changes in hydroperiod within WCA 3A and WCA 2A with the Deep FEB alternative. These slight decreases in hydroperiod (14 to 30 days) are located in the very northeast of the Miami Canal, an area that experiences an edge effect from the Miami Canal and the majority of which is already heavily impacted by cattails with shrubs. The very localized hydroperiod increases (15 to 18 days longer) in WCA 2A are not considered significant enough to shift vegetation in the area since this WCA is almost entirely already innundated for 300 or more days per year.

Alternative 4 (STA)

Anticipated vegetative responses from reductions in phosphorus are equivalent to those described for the Shallow FEB alternative above. There were no RSM modeled changes to hydroperiod or ponding depth with the STA alternative. There would however be a new upstream water demand to keep the STA hydrated which is not considered in the modeling effort or quantified.

4.7.1.2.4 Holey Land Wildlife Management Area

No impacts to vegetation within Holey Land would occur with Alternative 2 (Shallow FEB) and Alternative 3 (Deep FEB) since no changes to the vegetation community is proposed. Alternative 4 (STA) would cause direct impacts to vegetation in Holey Land to construct a conveyance discharge canal located within the Holey Land boundary adjacent to the project site along the northern portion of the east border of Holey Land. Alternative 4 would impact approximately 250 acres of wetlands withn Holey Land to construct the new discharge canal, which would allow treated discharges from the A-1 STA to be conveyed to the L-5 Canal. According to the 2005 Florida Natural Areas Inventory survey, this area is primarily a cattail monoculture wetland (SFWMD 2012- 2012 SFER Volume III Appendix 5-4).

4.7.2 WETLANDS

4.7.2.1 No Action Alternative

4.7.2.1.1 Project site

Under the No Action Alternative there would be no additional discharges to waters of the United States, including wetlands; however, the wetlands would experience other effects. The A-1 project site would either remain in its existing condition or be utilized for agricultural purposes. If the site were to remain undisturbed, the vegetation at the site would continue to be dominated by weedy and invasive species. The 187 acres of true depressional wetlands that were present in 2005 are now in a degraded condition with 90% nuisance and exotic species such as Elephant grass (*Pennisetum purpureum)* and castor bean. A continued expansion of these undesirable species and degradation of wetlands at the site would be expected. If the agricultural activities would resume on the project site, the wetlands would be cleared of vegetation, and pumping would drain the water off of the lands. The existing wetland vegetation would be replaced with agricultural plants, such as sugar cane or sod.

4.7.2.1.2 STA 2, STA 3/4, WCA 2A, WCA 3A, Holey Land

STA 2 and STA 3/4 would continue to be managed for either EAV or SAV and open water areas. Therefore, there no changes anticipated in the wetland vegetation within the STAs. Although the existing STAs provide phosphorus treatment to the WCAs, there would be a continued degradation to downstream wetlands and dense cattail areas expansion with the no action alternative due to the WQBEL not being met. Cattail is considered a high nutrient status species that is opportunistic and highly competitive, relative to sawgrass, in nutrient-enriched situations (Toth, 1988; Davis, 1991). This is demonstrated by Figure 3-15 in Section 3.7.3, which shows that cattail coverage increased 38% within WCA 3 from 1995 to 2004. Similar effects are anticipated for WCA 2. Several studies conducted within WCA 2A show that cattail out-compete sawgrass in their ability to absorb excess nutrients with increased cattail production during years of high nutrient inflows (Toth, 1988; Davis, 1991). Davis (1991) concluded that both sawgrass and cattail increased annual production in response to elevated nutrient concentrations, but that cattail differed in its ability to increase plant production during years of high nutrient supply. Therefore, continued input of phosphorus into the WCAs above the WQBEL is anticipated to continue to degrade wetland vegetation and increase cattail expansion.

4.7.2.2 Action Alternatives

4.7.2.2.1 Project site

Alternative 2 (Shallow FEB)

Construction of the Shallow FEB would fill and excavate 435.9 acres of wetlands and surface waters. Of the 435.9 acres of impacts, 280.1 acres of wetlands would be filled to construct the levee, 112.8 acres of waters of the U.S. would be filled to raise the elevation of canals and ditches to the adjacent wetland elevation, and 75.8 acres of canal would be excavated. The Shallow FEB would be operated at an average depth of 1.5 feet and the maximum depth is 4 feet. Emergent aquatic wetland vegetation is expected to be maintained or grow within the Shallow FEB. Therefore, approximately 10, 820.3 acres of wetlands will be inundated with water up, with maximum levels of four feet in depth after a severe storm event such as a hurricane or tropical storm.

The construction features causing permanent wetland impacts include interior and exterior perimeter levees, a collection canal and inflow and out flow structures. Wetland conditions would occur within the Shallow FEB after construction is complete and operation of the FEB begins.

Alternative 3 (Deep FEB)

Construction of a Deep FEB would result in 576.6 acres of unavoidable adverse impacts to wetlands and waters of the U.S. as a result of levee and canal fill, canal excavation, and excavation of freshwater wetlands. Of the 576.6 acres of impacts, 533.6 acres of wetlands would be filled to construct the levee and 43.0 acres of canal would be excavated. Alternative 3 would not require fill in canals or ditches. The Deep FEB would be operated at an average depth of six feet and the maximum depth is 12 feet. During times of deeper water depths, no rooted wetland vegetation is expected to be maintained or grow within the Deep FEB. During times when the inundation would be greater than four feet during parts of the year, emergent marsh habitat at the site would have a less optimal hydrology during those times when the water levels are greater than four feet. The remainder of time when water levels are below four feet, it is anticipated that either submerged aquatic or emergent marsh vegetation would be present. There would be about 10,820 acres of wetlands that would be flooded as a result of this alternative.

Alternative 4 (STA)

Construction of an STA would result in impacts to 986.4 acres of wetlands and waters of the United States to include 353.6 acres of fill to construct the levee, 112.8 acres of fill to raise the elevation of canals and ditches, 270 acres of canal excavation, and 250 acres of excavation and fill within Holey Land Wildlife Management Area. Wetland impacts within the Holey Land Wildlife Management Area are required to construct a new discharge canal to allow treated discharges from the A-1 STA to be conveyed to the L-5 Canal. Therefore, 125 acres of wetlands would be excavated to create the canal and 125 acres of wetlands would be filled to create the berms on either side of the canal. The STA would be operated at an average depth of 1.25 to 1.5 feet and the maximum depth is 4 feet. The impacts would be due to construction of interior and exterior levees, interior cell/flowway earthwork to bring areas to appropriate elevations and construction of internal and external water control structures. Emergent and submerged aquatic vegetation is expected to be maintained or grow within the STA. Similar to the shallow FEB, approximately 10,820 acres of wetlands will be inundated with water up to four feet.

4.7.2.2.2 STA 2, STA 3/4, WCA 2A, WCA 3A, Holey Land

There are no impacts to downstream wetlands with any of the action alternatives. Improved water quality resulting from the action alternatives would slow the spread of nuisance cattail within these areas (especially the WCAs) causing an overall improvement in wetland conditions.

4.8 FISH AND WILDLIFE

4.8.1 OVERALL FISH AND WILDLIFE

4.8.1.1 No action

4.8.1.1.1 Project site

Under the No Action Alternative, no significant change would likely result to fish and wildlife populations on the project site if the site were to remain fallow. The project site would continue to provide habitat to wildlife utilizing the property. However, it is anticipated that exotic plant species would continue to encroach on the site. The increase in exotic plant species may reduce the wildlife utilization in the future as the dominance of exotic plant species as elephant grass and castor bean lowers the function and value of the wetlands. If the site were to return to agricultural use, the fish and wildlife populations on the site are expected to be reduced as the agricultural activities may disturb nesting and foraging.

4.8.1.1.2 STA 2 and STA 3/4

Currently, the STAs provide high quality habitat for fish and wildlife species as described in Chapter 3. Under the No Action Alternative, the fish and wildlife habitat is expected to continue to support a wide variety of wading birds and other wildlife in the STAs.

4.8.1.1.3 WCA 2A and WCA 3A

Colonial wading birds utilize the WCAs as both feeding and breeding habitat. The most common species utilizing the WCAs include the white ibis, great egrets, snowy egrets, cattle egrets, great blue herons, tricolored herons, little blue herons, green herons, black-crowned night herons, yellow-crowned night herons, wood storks, and glossy ibis, with populations varying widely in relationship to seasonal water level fluctuations. Current trends in water quality within the WCAs impact fish and other aquatic wildlife populations directly and indirectly by altering the vegetation, which affects foraging habitat of wetland dependent species. As nutrient loadings to surface water within the WCAs decrease, water quality should continue to improve. Under the No Action Alternative it is expected that STA discharges would not meet the WQBEL and water quality and the aquatic habitat within the WCAs would continue to decline.

4.8.1.1.4 Holey Land Wildlife Management Area

Similar to WCAs, Holey Land provides aquatic habitat to a wide variety of fish and wildlife species. Under the No Action Alternative, the wildlife species use is not expected to change in the Holey Land.

4.8.1.2 Action Alternatives

4.8.1.2.1 Project Site

Construction of a Shallow FEB and an STA would improve the fish and wildlife usage on the project site. The site conditions would change from low quality wetlands with several areas containing a dominance of exotic plant species to a wetland containing native plant species and depths of water up to four feet. Exotic plant species would be removed and the site maintained in perpetuity. Existing STAs are evidence that water depth up to four feet in the impoundment provides abundant habitat for a diverse array of wildlife species.

Although the Deep FEB would provide more aquatic habitat than the existing site conditions, the Deep FEB would provide less functional aquatic habitat than the Shallow FEB or STA. Many of the wading birds require shallow water depths to capture prey fish that utilize emergent vegetation. The deeper water depths of the Deep FEB would preclude emergent vegetation from establishing and foraging habitat for the shallow water dependent species, which include several State-listed birds, such as the Florida sandhill crane, limpkin, snowy egret, little blue heron, tricolored heron, white ibis, and roseate spoonbill.

4.8.1.2.2 STA 2 and STA 3/4

The Shallow and Seep FEB alternatives would improve fish and wildlife habitat as the FEBs would operate in a manner as to avoid dryout in the STAs. The STAs would maintain a more steady state of water depths as the FEBs would provide water when the STAs require. In addition, there would be less impact to nesting birds in the STAs with the two FEB alternatives. As described in Section 3.8.3.1, the STAs contain habitat for several State-listed birds, such as the Florida sandhill crane, limpkin, snowy egret, little blue heron, tricolored heron, white ibis, and roseate spoonbill. In addition, the Florida burrowing owl, the least tern, and black necked stilts are known to nest within or near the STAs. Per email from Florida Department of Environmental Protection (FDEP) on April 23, 2013, the reddish egret is not expected to utilize the STAs. Currently, if the STAs dry out, these birds could nest in the dry lands. As the areas are re-flooded, there is the potential for the sudden increases in water depths to flood the nesting birds. The FEB alternatives would assist the STA and avoid dryouts.

There would be no change to wildlife usage in STA 2 and STA 3/4 if the STA Alternative were constructed.

4.8.1.2.3 WCA 2A and WCA 3A

Overall wildlife habitat benefits are expected to occur in WCA 2A and WCA 3A with the construction of the Action Alternatives. Specifically, improved water quality within STA 2 and STA 3/4 would decrease the phosphorus loading entering into the WCAs, which would help to restore the vegetation communities within the WCAs over the long-term. Currently, annual average flow-weighted TP concentrations in WCA 2A and WCA 3A for water year 2011 are 18 and 20 ppb, respectively (SFWMD, 2011, Chapter 3A.). As seen in WCA 2A, increased TP loads entering the WCA have contributed to dense monotypic stands of cattail vegetation at the areas where water enters the WCA. The monotypic and dense growth patterns of invasive vegetation support less diverse fish and wildlife than native vegetation. Less dense vegetation can establish more ideal foraging habitat for many predatory bird and fish species by providing greater access to prey. This in turn can make WCAs more ideal nesting locations. Therefore, a reduction in TP entering the WCAs would likely improve foraging and nesting habitat for fish and wildlife species.

4.8.1.2.4 Holey Land Wildlife Management Area

The construction of the Shallow FEB or the Deep FEB is not expected to affect wildlife usage in the Holey Land since the FEB Alternatives would have no effect on the water entering the Holey Land. With the STA Alternative, a conveyance discharge canal would be constructed within the

Northern portion of the eastern boundary of the Holey Land. The area is currently cattail, but would be converted to a canal. Therefore, the construction of the STA would convert a portion of cattail wetlands to a canal with floating aquatic vegetation, which would impact the species currently utilizing the cattail marsh.

4.8.2 FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

The following sections document potential impacts to federally-listed threatened and endangered species, species of special concern (SSC), and designated critical habitat that could occur from the No Action Alternative and Action Alternatives 2, 3, and 4. The impact analysis includes listed species that have the potential to occur within the project footprint, the STAs directly affected by the proposed project (STA 2 and STA 3/4), and the downstream secondary project-affected regions (WCA 2A and WCA 3A).

Direct impacts are defined as impacts that occur within the footprints of the proposed project site during or as a direct result of construction and operation activities. Indirect impacts are defined as impacts that occur outside of the footprints of the proposed project but are still within the affected regions, or that occur within the footprints of the downstream STAs and WCAs. Due to the potential for adverse impacts to fish and wildlife, in particular threatened or endangered species and their habitat, the operational and monitoring plans for the proposed project are of particular importance to USFWS.

The Action Alternatives provide the opportunity for minor to major changes in the hydropatterns of the WCAs dependent upon the ability to provide improved treatment capacity of STA 2 and STA 3/4. With the No Action Alternative, a regional trend towards improvements in water quality, quantity, and timing may occur from planned restoration projects in the Everglades. Overall, this is anticipated to improve habitat within the project primary and secondary affected regions as defined in Chapter 3. The Proposed Action (Alternative 2, Shallow FEB) is expected to further increase these improvements. The extent of the enhancements with the No Action and Action Alternatives would depend on the manner in, and extent to which, the treatment capacity provided by existing and anticipated features is used in the context of other regional water management infrastructure and system operations made possible by the presence of any additional treatment or storage capacity.

The Proposed Action is not intended to propose, direct, or otherwise mandate specific changes in Central and Southern Florida (C&SF) System project operations identified in existing operations manuals (i.e., Lake Okeechobee Regulation Schedule or WCA Regulation Schedule), as determined in the future for restoration-related purposes. The effects on listed species discussed below are based on wildlife surveys, field observations, literature, reasonable scientific judgment, SFWMM, DMSTA, and SSDM results.

The USACE is currently preparing a separate biological assessment (BA) in accordance with Section 7(c) of the Endangered Species Act comparing the construction and operation of the A-1 Shallow FEB as described in the applicant's preferred alternative (Alternative 2) to the existing conditions in the affected regions. This BA also provides the USACE's final effects determination for listed species and critical habitat, and will be included as an Appendix in the final EIS. The BA evaluated the effects by comparing the Applicant's Preferred Alternative (Alternative 2) to the No Action Alternative (Alternative 1).

4.8.2.1 American alligator

The American alligator is found within freshwater and brackish aquatic habitats in south Florida. American alligators were not observed on the A-1 project site during the field visits to the site, but are commonly found in and on canal banks within the EAA. Although the American alligator is not actually threatened or endangered it is listed due to the similarity in appearance to the threatened American crocodile. No consultation is required for the alligator.

4.8.2.2 Eastern indigo snake

Upland and dry habitats (flatwoods, dry prairies, tropical hardwood hammocks, and coastal dunes) are the preferred habitats of eastern indigo snakes (USFWS 1999). While drier, upland habitat is limited in the project-affected regions, these species may also forage along the edges of freshwater marshes and in agricultural fields and along their banks within the EAA. This species also utilizes gopher tortoise burrows, so potential gopher tortoise habitat was considered in determining potential effects of the Action Alternatives on the eastern indigo snake. In addition to gopher tortoise burrows, the eastern indigo snakes use natural and man-made holes and burrows for refugia. Eastern indigo snakes were found on the project site during construction activities for the A-1 Reservoir.

4.8.2.2.1 No Action

No direct impact on the eastern indigo snake is expected with the No Action Alternative. The site would either remain undisturbed or agricultural activities could resume. If agricultural activities continue on the site, approximately 10,820.3 acres of wetlands within the A-1 project site would remain undisturbed or be utilized for agriculture. The Eastern indigo snakes use agricultural fields as habitat and depending on the particular type of agricultural use, these areas may provide habitat that support a higher density of snakes found in natural upland habitat.

Indirect impacts could be attributed to soil subsidence. Wetter conditions are expected in the EAA by 2050 because of soil subsistence. Subsidence could therefore cause conditions in the EAA to be less favorable for the eastern indigo snake, which prefers drier, upland habitats. However, eastern indigo snakes may still utilize these areas as habitat.

4.8.2.2.2 Action Alternatives

Action Alternatives 2, 3, and 4 are anticipated to have a direct impact on the eastern indigo snake. Construction of the Action Alternatives would result in the conversion of 10,820.3 acres of wetlands to an above ground impoundment containing either 4 feet of water or 12 feet of water. Disturbed wetlands may be used by eastern indigo snakes, but are not preferred habitat. The eastern indigo snakes may forage along the edges of the FEBs or the STA during drier periods, but conditions within the impoundments would generally not be suitable because these areas would be permanently inundated.

Construction activities may also result in eastern indigo snakes leaving the area, abandoning den sites, and possibly losing foraging and mating opportunities. In addition, construction activities associated with the earth-moving equipment may increase the likelihood of Eastern indigo snakes being adversely impacted. Heavy machinery, which would be re-contouring ground levels, removing and relocating berms, and constructing roads, may unearth eastern indigo snakes and cause inadvertent impacts to occur. The applicant would require the construction workers to be aware of the eastern indigo snake and its habitat, and be informed how to identify the snake if found. The eastern Indigo Snake Construction Precautions would be required to be adhered during all construction activities.

Indirect impacts from the Action Alternatives to the eastern indigo snake could occur with all Action Alternatives from increased traffic and post construction activities. Increased traffic could increase the likelihood of direct mortality along roads in the area. The post-construction activities associated with the proposed FEBs and the STA that may cause impacts to the eastern indigo snake include maintenance of the roads, levees, pump stations, and cells (including vegetation management methods such as mowing, herbicide application, and physical removal). In addition, indirect impacts may occur to the eastern indigo snake due to the potential inundation of snake habitat during rehydration of the cells in the event the cells become dry after initial flooding. Protective measures alerting the contractor of the potential presence of this species and its protected status would also be used during the construction to avoid direct takes of the species. Indirect effects from changing the water elevations in downstream areas (STA 2, STA 3/4, WCA 2A, and WCA 3A) are not anticipated to cause an unacceptable adverse effect to the eastern indigo snake as.

4.8.2.3 Audubon's crested caracara

The Audubon's crested caracara nests primarily in cabbage palm trees and forages in vegetated areas less than one-foot in height. The USFWS Standard Local Operating Procedures for Endangered Species (SLOPES) defines the primary protection zone for this species as 985 feet outward from a nesting tree. The secondary zone is 6,600 feet outward from an active nesting tree. The project site is located within a USFWS consultation area for the crested caracara; however, no juvenile gathering areas are located within these areas. During field surveys, no Audubon's crested caracaras were observed on the project site. In addition, there are no cabbage palm trees located on the project site.

4.8.2.3.1 No Action

No direct or indirect impacts to caracara are anticipated under the No Action Alternative. Caracaras prefer dry and wet prairies with scattered cabbage palms but have adapted well to improved pasture (USFWS 2004). Although the existing vegetative communities within the project site may provide some foraging habitat for caracara, it is primarily fallow cropland with taller, woody vegetation that is not preferred for foraging as the current vegetative coverage is greater than 1 foot in height. The vegetative communities would remain as is (no effect) or would return to active agriculture (moderately improved foraging habitat).

4.8.2.3.2 Action Alternatives

No direct impacts to caracara are anticipated with construction of Alternatives 2, 3, and 4. The exotic vegetation in the wetlands is above 1 foot high and thereby does not provide suitable foraging habitat. The Audubon's crested caracara generally does not forage in vegetation greater than 1 foot in height.

The project site is located within a USFWS consultation area for the crested caracara but outside known juvenile gathering areas. The Species Conservation Guidelines for Crested Caracara (USFWS 2004) state that no effect from the project is anticipated on the caracara if on-site surveys of suitable habitat within the consultation area do not detect caracara nests. The site does not contain palm trees; therefore, the site is not expected to provide suitable nesting activity. No known nest sites are located within 6,600 feet of the project site.

Indirect impacts from the Action Alternatives to the caracara include an increase in traffic volume and changes to downstream habitats. Caracaras frequently prey on wildlife struck by vehicles. An increase in traffic would likely increase road kills, thereby increasing the risk of caracaras being struck by vehicles while preying on dead animal carcasses. However, the increase in traffic is expected to be minimal.

There would be no effects to the Audubon's crested caracara within the STA 2 and STA 3/4 as the STAs so not provide suitable foraging habitat. Alternatives 2, 3, and 4 would improve water quality in WCA 2A and WCA-3A by reducing phosphorus loads and concentrations, thereby maintaining the existing crested caracara foraging habitat by decreasing the rate of cattail expansion and that of other invasive plants. The indirect effect on the caracara would be that native wet prairie vegetation used for foraging would remain for a greater period of time.

The increases in water levels within WCA 2A and WCA 3A are minor. For alternative 2, WCA 2A would experience hydroperiod to extend 17 days longer per year than the No Action Alternative, 15-18 day longer for Alternative 3, and no change in Alternative 4. For WCA 3A, the hydroperiod would be 14-30 days shorter per year for Alternatives 2 and 3, and no change to the hydroperiod for Alternative 4. Therefore, access to prey availability would not change in the WCAs.

No changes in the Holey Lands are expected to occur as a result of Alternatives 2 and 3; therefore, they would have no effect on the Audubon's crested caracara. Construction of Alternative 4 (STA) would convert cattail wetland to a canal. Since the wetlands are not foraging habitat, the construction of the STA would also have no effect on the caracara.

4.8.2.4 Everglade snail kite

The project site, STA 2, STA 3/4, WCA-2A, WCA-3A, and the Holey Land are all within USFWS consultation area for the Everglade snail kite. In addition, WCA- 2A and WCA 3A are located within designated critical habitat for the Everglade snail kite. Everglade snail kite nesting or foraging was not observed on the project site.

In Florida, Everglade snail kites forage almost exclusively on apple snails that are found in freshwater marshes and shallow vegetated littoral zones of lakes. Therefore, this evaluation focuses on both potential impacts to the snail kite itself and the apple snail, its most important prey item.

4.8.2.4.1 No Action

No direct impacts to snail kites, apple snails, or designated snail kite critical habitat would be expected with the No Action Alternative. Marsh and scrub wetlands on the project site may be converted back to agricultural lands. Although apple snail populations may occur within remnant natural wetlands, ditches, and canals, no apple snail egg casings were observed in the surveys on the project site, which indicates it is unlikely that Everglade snail kite currently use this area for foraging.

4.8.2.4.2 Action Alternatives

The potential for direct impacts to snail kites exists from construction of Alternatives 2, 3, and 4. With these alternatives, approximately 10,820.3 acres of freshwater wetlands and waters of the United States would be converted to aquatic habitats containing a variety of EAV, SAV, and/or FAV plant species. Relatively clear and open marshes and littoral zones with low-profile marshes (10 feet or less in depth) are ideal foraging habitat for the Everglade snail kite (USFWS 1999). Therefore, the construction of the deep FEB would offer the least benefits to the snail kite. The wetland systems that would be created as a result of the shallow FEB and the STA would provide better habitat for apple snails and the Everglades snail kite. During normal operations, the SAV and EAV cells would be operated at target depths of less than 4 feet of water, which is suitable foraging habitat for the snail kite.

Indirect impacts from the Action Alternatives would likely vary by alternative and include increased traffic levels as well as changes in hydrology and vegetation in affected regions, primarily the WCAs. The three main parameters considered in the evaluation of potential indirect impacts with the Action Alternatives are traffic, the cycle and duration of dry-down events, and changes in vegetation, each of which are described below.

Traffic: Increased traffic could result in a higher risk of direct mortality. Even though snail kites do not typically forage along roadways, they have been often observed foraging along levees in stormwater treatment areas. Slower traffic would not be expected to cause an unacceptable adverse effect since snail kites can easily avoid slower moving vehicles. Snail kites have been known to nest near levee roads. These nests are typically easy to identify and traffic restriction can be applied to limit nest disturbance.

Dry Down Events: Apple snails need EAV to thrive. Both apple snail and snail kite population success are directly affected by depth and duration of marsh flooding (Johnson et al. 2007). The following are the hydrologic parameters/criteria that were considered in evaluating potential impacts to snail kites and apple snails:

• Dry-down periods with a 1- to 2-month period were considered optimal for apple snails, while greater than a 2-month dry-down was considered unfavorable;

• A dry-down period between March and April was considered unfavorable as this time period was documented by Darby (1997, 2003) to be a peak in apple snail egg cluster production;

• Dry-down events occurring in a 3- to 5-year cycle were considered optimum snail kite habitat; and

• Dry-down events occurring in a 2- to 3-year cycle (slightly drier than optimum) or occurring in a 5- to 6-year cycle (slightly wetter than optimum) were considered marginal snail kite habitat.

Alternatives 2 (Shallow FEB) and Alternative 3 (Deep FEB) are designed to minimize the dry-down events in the STAs (STA 2 and STA 3/4) so the FEBs would improve conditions for the Everglades snail kites utilizing the STAs. Alternative 3 (STA) offers the least amount of benefits within STA 2 and STA 3/4 since the intent of the proposed STA would not operate to prevent dry-downs events.

Changes in the water levels within WCA 2A and WCA 3A are minor. As compared to the No Action Alternative, the hydroperiod within WCA 2A would experience wet conditions 17 days longer per year with Alternative 2, 15-18 day longer for Alternative 3, and no change in Alternative 4. Alternatives 2 and 3 would benefit the Everglades snail kite, while Alternative 4 would not cause any additional impacts. For WCA 3A, the hydroperiod would be 14-30 days shorter per year for Alternatives 2 and 3, and no change to the hydroperiod for Alternative 4. Therefore, Alternatives 2 and 3 (the FEB alternatives) would reduce the available foraging areas slightly while Alternative 4 would have no change.

Vegetation: Because the Action Alternatives would decreases phosphorus loads and concentrations within the WCAs, all of the alternatives would not contribute to the cattail expansion within the WCAs. By meeting the water quality criteria for phosphorus in the EPA, improvements to the Everglades snail kite foraging habitat are anticipated. Everglade snail kites forage by either still-hunting from a perch or by flying above the water surface and visually locating prey. Relatively clear and open marshes and littoral zones with low profile marshes (3 meters or less in depth) and shallow open water are ideal foraging habitat for the Everglade snail kite (USFWS 1999). Increased levels of phosphorus in Lake Okeechobee and the Everglades have resulted in dense stands of emergent invasive vegetation that has replaced the foraging habitat for the Everglade snail kite. A decrease in cattail coverage is considered beneficial to the Everglade snail kite and its designated critical habitat.

4.8.2.5 Wood Stork

Wood stork foraging and nesting habitat occurs on the project site, STAs 2 and 3/4, and WCAs 2A and 3A. Wood storks were observed on the project site.

4.8.2.5.1 No Action

Direct impacts from the No Action Alternative include decreasing the amount of preferred aquatic foraging habitat for wood storks from the conversion of 10,820.3 acres of freshwater wetlands to active agriculture. Atypical sod and sugar cane fields would still provide foraging habitat, but would be of a lower quality than the freshwater marsh and wetland scrub habitat that exists there currently.

Indirect impacts are not anticipated under the No Action Alternative. STA 2 and 3/4 are intended to be operated under their current operational plans and discharges into WCA 2A and WCA 3A would continue.

4.8.2.5.2 Action Alternatives

Anticipated direct impacts from construction of the Shallow FEB and STA would likely increase the preferred aquatic foraging habitat available to the wood stork from the conversion of 10,820.3 acres of low quality wetlands to flooded cells with EAV and SAV, which may include areas over open water and appropriate water depths for foraging. This conversion would result in beneficial effects for wood storks by replacing lower-quality foraging habitat with higher quality shallow, inundated wetlands. Existing agricultural canals and ponds within the project site would be filled to create wetland habitat, but deeper canals (conveyance and collector canals) would continue to be in use and available to the wood stork. The construction of the Deep FEB would not provide wood stork foraging habitat as the water depths are too deep to support foraging (over 18-inches of water depths).

Indirect impacts from the Action Alternatives would likely occur and would include impacts associated with changes to hydrology and vegetation in affected regions from altered hydroperiods and phosphorus levels. Overall regional improvements to foraging and nesting habitat, as a result of improved vegetative communities and fish and wildlife habitat are anticipated. However, effects within the STAs may vary for the Action Alternatives.

The FEB alternatives (Alternatives 2 and 3) would reduce the frequency of dry-downs within STA2 and STA 3/4. Therefore, the FEBs would improve wood stork foraging habitat within the STAs. Alternative 4 (STA) would not operate to reduce the potential for dry-downs within the existing STAs; therefore, Alternative 4 would have no effect on the wood stork foraging habitat within STAs 2 and 3/4.

An overall anticipated regional trend toward restored water quality is expected to improve vegetative communities, water quality, and fish and wildlife habitat in WCA 2A and WCA 3A. It is anticipated that this improvement would likewise enhance wood stork foraging habitat and access to prey items in these areas. Wood storks typically forage in water depths 18 inches or shallower. The Action Alternatives would not change the average high and low water levels during the wet or dry seasons to be either deeper or shallower than 18 inches compared to existing conditions.

4.8.2.6 Florida panther

Panther telemetry data from 1981 to 2005 show panthers in the EAA, including areas directly adjacent to the project site and in WCA 3A (USFWS 2006). Figure 3-14 describes Panther telemetry data from 1997 through 2006 (URS 2007c) while Figure 3-15 indicates recent occurrences in the area (FWS database). Panthers may hunt on the project site, but it is unlikely that they would use these areas for any extended length of time because of the lack of suitable long-term panther habitat (URS 2007). Panthers were not observed on the project site during the field surveys.

4.8.2.6.1 No Action

No anticipated direct impacts in the form of mortality, injury, or loss of habitat to the Florida panther would occur with active agriculture resuming on the project site because the project site is not considered preferred habitat for the Florida panther. Although panthers may traverse through the project site, they are not expected to use these areas for an extended period because of a lack of suitable, long-term habitat. Conversion of wetlands to active agriculture would reduce suitable habitat for feral hogs and white-tailed deer, two prey items for the panther. Although this habitat is not ideal for panther foraging, this conversion would decrease the hunting ability of the panther within the A-1 project site and would result in an indirect effect through decreased prey availability.

4.8.2.6.2 Action Alternatives

Direct impacts to panthers from the construction of Alternatives 2, 3, and 4 would likely occur from conversion of 10,820.3 acres of freshwater wetlands to deeper water wetland areas with EAV and SAV, thereby reducing potential ranging, resting, and foraging habitat on the A-1 project site. In addition to becoming permanently inundated, the build-out areas would not be as accessible to the Florida panther because of the network of canals and ditches, leading panthers to travel longer distances to cross these portions of the EAA. Nevertheless, panthers would still be able to traverse through these lands or use them for resting after they are converted to the Shallow FEB or STA, but would not be able to utilize the land if they are converted to the Deep FEB. All Action Alternatives would reduce potential habitat for feral hogs and white-tailed deer in on the project site, two prey items for the panther. Although this habitat is not ideal for panther foraging, the conversion could decrease the hunting ability of the panther, resulting in an indirect impact similar to the No Action Alternative. In addition, construction of the build-out areas would contribute to the cumulative effect of other Comprehensive Everglades Restoration Plan (CERP) and large-scale environmental restoration projects, causing panthers to travel longer distances through portions of the EAA.

Indirect impacts on panthers include increased traffic levels, increased noise disturbance and reduction in value of panther habitat adjacent to the project due to habitat fragmentation. In past years, several road kills have occurred on CR 835/833 as a result of vehicles entering in and off the project boundaries. However, the project construction would result in increased traffic consisting of heavy equipment and employee vehicles. All vehicles would be required to obey posted speed limits for off road and for improved road travel. Impacts associated with construction traffic would be localized due to construction occurring in phases such that panthers can avoid the areas that are under construction. Additionally, all entrances would be secured with gates to control access. Noise levels would also be localized as the different phases are under construction.

With Alternatives 2, 3, and 4, slight changes to the hydrological conditions in WCA 2A and WCA 3A are anticipated, but these changes are not anticipated to impact the Florida panther. The project site is not located within the primary or secondary zone of the Florida panther, but is located within the consultation areas. Indirect impacts are also not anticipated in the Holey Lands.

4.8.3 STATE LISTED THREATENED OR ENDANGERED SPECIES

4.8.3.1 No Action Alternative

The current site conditions do not support habitat for the Gopher tortoise (*Gopherus polyphemus*), Florida gopher frog (*Rana areolata aseopus*) or the Florida mouse (*Podomys floridanus*) as these species prefer a dry, xeric upland habitats. The agricultural fields may currently provide nesting and foraging habitat for the Florida burrowing owl (*Athene cunicularia floridana*) as they nest in agricultural areas. There would be no change to any state listed threatened or endangered species on the project site under the No Action Alternative.

4.8.3.2 Action Alternatives

The Shallow FEB and STA alternative would improve foraging and nesting habitat for the state listed wading birds. When water levels are greater than 4-feet in depth, the Deep FEB would not provide foraging or nesting habitat as water levels are too deep for even long-legged species of birds. All of the Action Alternatives would provide foraging habitat for the black skimmer (*Rynchops niger*); however the Shallow FEB and the STA alternatives may also provide areas of nesting. The levees in all of the Action Alternatives would provide nesting habitat for the burrowing owl as they nest in the ground in areas with little understory vegetation. Additionally, the levees would provide ground nesting habitat for least tern colonies. Each of the Action Alternatives would not provide habitat for the Gopher tortoise, gopher frog, and the Florida mouse, as site conditions would be too wet. Prior to and during construction activities, the SFWMD will conduct wildlife surveys to include both federal and state-listed species to document the wildlife utilizing the site. The SFWMD will notify the Florida Fish and Wildlife Conservation Commission if any burrowing owls are detected during construction activities.

4.8.4 MIGRATORY BIRDS

Migratory birds are expected to utilize the A-1 project site, in particular black-necked stilts (*Himantopus mexicanus*), least terns, killdeer (*Charadrius vociferus*), and burrowing owls . An Avian Protection Plan (APP) is a voluntary set of guidelines to reduce impacts to nesting migratory birds as a result of flooding. In the event that conditions become favorable for nesting, the Avian Protection Plan for Black-necked Stilts and Burrowing Owls Nesting in the Everglades Agricultural Area Stormwater Treatment Areas will be implemented for Alternative 4 (STA) (SFWMD 2008). For the STA alternative, an APP plan is appropriate as they are less dense and potentially open water areas within the SAV cells. These typical STA conditions are more conducive to ground nesters. This will not be the case for the shallow FEB alternative which is anticipated to remain more densely vegetated once the project is complete. Due to the uncertainty of whether ground nesters currently or in the future will utilize the A-1 project site for nesting, the SFWMD does not recommend implementing an APP at this time for the FEB Alternatives, as this will significantly impact operational intent and flexibility of the facility.

The SFWMD is proposing to conduct its standard Endangered Species Act and Migratory Bird Treaty Act training prior to construction and monitor for black-neck stilts, burrowing owls and other ground nesting birds during construction and the two-year period in which the facility will be undergoing operational testing and monitoring. During the two-year period when the facility is in operational testing, surveys will be conducted regularly to confirm presence or absence of black-neck stilts and burrowing owls. If ground nesting birds are detected the SFWMD will coordinate with USFWS.

4.9 CULTURAL, HISTORIC AND ARCHEOLOGICAL RESOURCES

Historic properties may be determined to be eligible to the National Register of Historic Places (NRHP) if it meets at least one of the four following criteria:

A) That are associated with events that have made a significant contribution to the broad patterns of our history; or
B) That are associated with the lives of a person significant in our past; or
C) That embody distinctive characteristics of a type, period, or method of construction, or that represents the work of a master, or that posses high artistic value, or represent a significant and distinguishable entry whose components may lack individual distinction; or
D) That has yielded, or may be likely to yield, information important in prehistory or history.

Historic properties may also be determined to be eligible based on "traditionally" cultural significance, or TCPs, which incorporates abstract believes and customs, and practices of a living community that have been passed down through generations,

Adverse effects to cultural resources include but not limited to altering, directly or indirectly, any of the characteristics that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the properties location, design, setting, materials, workmanship, feeling, or association. Examples of adverse effects are physical damage or destruction, modification to the setting, or alteration of the integrity and character of the physical or abstract features, and/or criteria that contribute to its historic significance.

4.9.1 NO ACTION ALTERNATIVE

4.9.1.1 Project site

There would be no impacts to cultural, historic, and archeological resources with the No Action Alternative.

4.9.2 ACTION ALTERNATIVES

4.9.2.1 Project site

Construction and operation of the action alterative (Shallow FEB, Deep FEB, and STA) would have no effect on cultural resources on the A-1 project site. The property has been previously impacted by long term agricultural practices and road and canal construction, resulting in a highly disturbed landscape. The A-1 site has been the subject of multiple investigations to determine the presence of cultural, historical and archeological resources. In 2002, the SHPO concurred that the A-1 project site does not require any additional cultural resource investigations since no cultural resource sites were encountered and the site has been heavily affected by sugar cane and sod cultivation practices. The most recent Phase I Cultural Resource Assessment Survey (CRAS) was conducted in July 2012 by the State Bureau of Archaeological Research (BAR) on behalf of the SFWMD. No sites eligible or potentially eligible to the NRHP were found in the project area. The CRAS conclusions recommended no further archaeological work at the A-1 property at this time. (*A Cultural Resource Assessment Survey of the EAA A-1 Property*, Palm Beach County, Florida, Bureau of Archeological Research, Division of Historical Resources, Department of State, State of Florida, September 2012). By letter dated March 7, 2013, SHPO stated that it is unlikely that any historic or archaeological resources will be adversely impacted by the proposed project.

4.9.2.2 Downstream areas

There are no known cultural resources within STA 2, STA 3/4, and WCA 2A. Therefore, there would be no effect on historic properties or cultural resources within these areas.

WCA 2B contains three (3) potential cultural resource sites, one of which is potentially eligible to be listed on the National Register of Historic Places, while WCA 3A and 3B contains 109 reported archaeological sites. Currently discussed in Chapter 3, these sites have not had extensive surveys and very little archaeological work has been done to understand how operational changes affect cultural resources within the WCAs. Until further analysis is completed on the effects of changing water levels within the WCAs, the USACE can only base our determination on the premise that if such impacts associated with changes to the hydrologic pattern have already impacted resources in the WCAs, then current proposed changes would have no effect on historic properties since the changes to inflows into the WCAs as a result of Alternatives 2, 3, and 4 are within the historical variation of water depths and durations for these areas. Therefore, none of the Action Alternatives would adversely affect cultural resources within WCA 2B, WCA 3A, and WCA 3B. In addition, the Action Alternatives would not diminish, modify, or alter the Everglades Restoration Transition Plan Human Remains Policy and Programmatic Agreement. However, until additional surveys are conducted within the WCAs, little will be known about the effects of changing water levels on the cultural resources in the area.

The creation of conveyance features associated with Alternative 4 (STA), which would convey STA outflows to the L-5 Canal for distribution to WCA 2A and 3A, would impact wetland areas within the Holey Land. There are no known cultural resource sites within Holey Land. Because earth disturbing activities would occur within Holey Land for Alternative 4 (STA), a CRAS would need to be conducted within the Holey Land to determine whether there are any eligible sites for inclusion in the NRHP.

4.10 TRIBAL RIGHTS

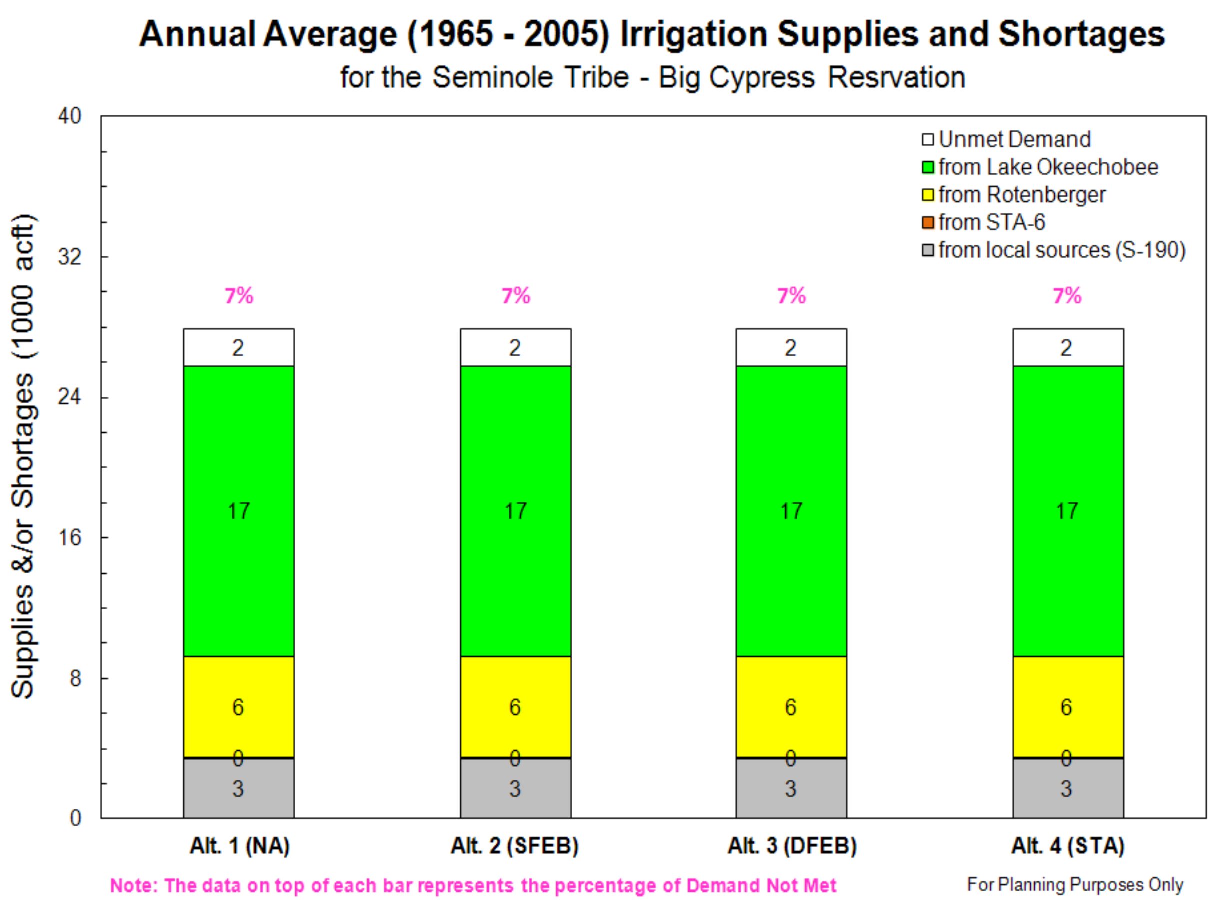
4.10.1 OVERVIEW OF THE SEMINOLE TRIBE WATER SUPPLY SOURCES

The Seminole Tribe has surface water entitlement rights pursuant to the 1987 Water Rights Compact (Compact) between the Seminole Tribe of Florida, the State of Florida, and the SFWMD (Pub. L. No. 100-228, 101 Stat. 1566 and Chapter 87-292 Laws of Florida as codified in Section 285.165, F.S.). According to the Compact, the surface water entitlement for the Big Cypress Reservation is based on the percentage of water available within the South Hendry County / L-28 Gap Water Use Basin as the lands of the Reservation are proportional to the total land acreage within the identified Basin.

The Entitlement Technical Report established a quantity of 47,000 acre-feet/year (65 cubic feet per second) as the surface water entitlement amount for the Seminole Tribe of Florida's Big Cypress Reservation. This quantity of water was required to be delivered in 12 equal monthly amounts of 3,917 acre-feet (Final Order 1998). The Seminole Tribe has requested that supplemental water supply be delivered to the Big Cypress Seminole Indian Reservation and the Big Cypress National Preserve and its Addition lands. Since the project purpose for this EIS is to achieve the WQBEL at the STA 2 and STA 3/4 discharge points in the Central Flowpath of the Everglades Protection Area utilizing existing water deliveries from Lake Okeechobee, additional supplemental water deliveries to the Seminole Tribe's land are not accomplished with the A-1 project. The entitlement volume is to be delivered primarily from the original entitlement source, the North and West Feeder Canal. When these volumes are insufficient, the Seminole Tribe relies on the secondary supply source, the G-409 pump station. Sources of water to G-409 include Lake Okeechobee, STA 3/4, STA 5/6, and Rotenberger Wildlife Management Area. The Action Alternatives will not change the existing operational plan for the G-409 pump station, and therefore, the Action Alternatives will have no impact on water supply for the Seminole Tribe of Florida's Big Cypress Reservation.

During the regional modeling for this EIS, SFWMD incorporated the delivery of surface water entitlement volumes that are consistent with the most current Work Plans. As shown in the **Figure 4-53** below, the annual average irrigation supplies (and sources) and shortages for the Seminole Tribe's Big Cypress Reservation are equivalent for all Alternatives (i.e. there is no change from the No Action Alternative). For all Alternatives, approximately 17,000 acre-feet of water is provided by Lake Okeechobee, 6,000 acre-feet is from Rotenberger Wildlife Management Area, and 3,000 acre-feet originates from local sources (e.g. East/West Feeder Canal S-190). All Alternatives, including the No Action Alternative, are not able to deliver approximately 7 percent (2,000 acre-feet) of the total entitlement volume for supplemental irrigation water in addition to falling short of the Tribe's request for supplemental water. The inability to deliver this approximately 7 percent of the Tribe's total entitlement volume for supplemental irrigation water is not attributable to any effect of construction of any A-1 Alternative. However, as stated above, when the volume of water is insufficient to provide water from the primary supply sources, real-time operations ensures that the Seminole Tribe receives their water entitlements through secondary supply sources.

Figure 4-53 Average Annual Irrigation Supplies for Big Cypress Reservation

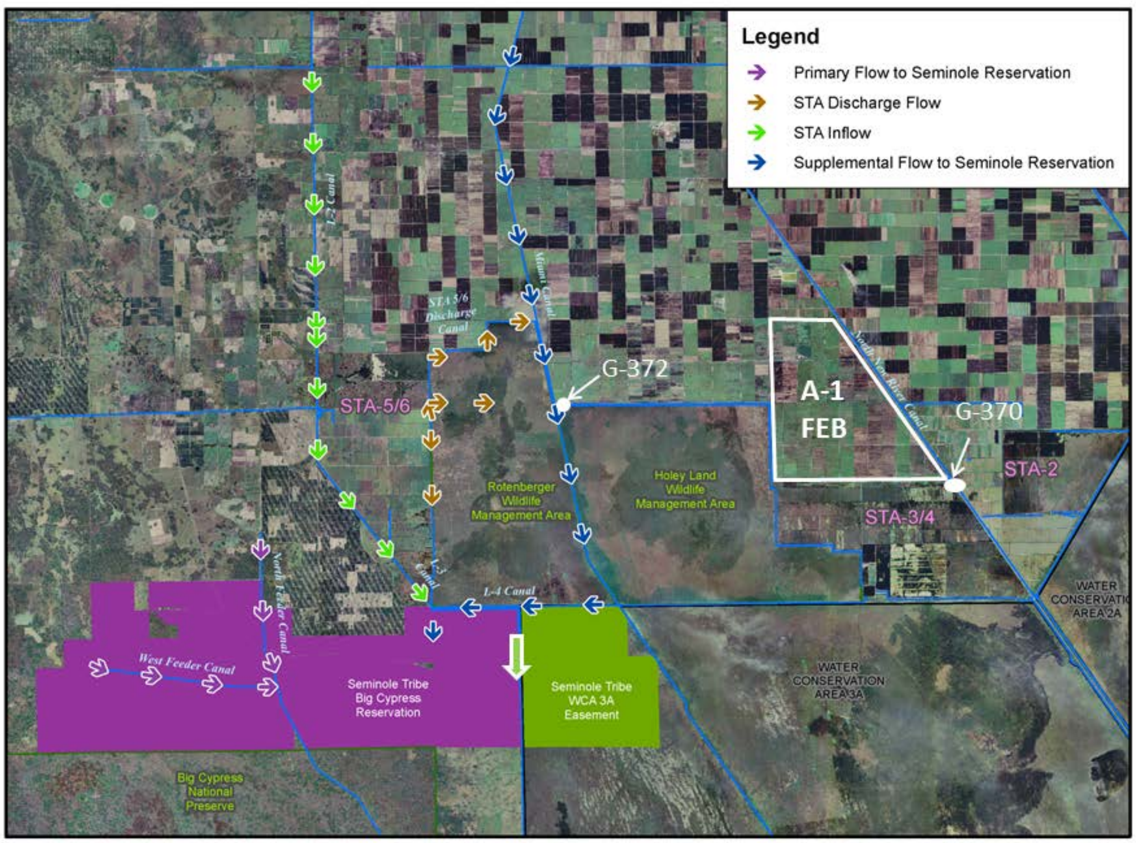


4.10.2 PROPOSED WATER FLOW

The A-1 FEB is located to the east of the Big Cypress Seminole Indian Reservation and is projected to receive inflows from Lake Okeechobee and basin runoff via G-370 on the North New River Canal and via G-372 on the Miami Canal as STA-3/4 receives those flows today. There would be no changes in the timing, magnitude and nature of water flows into the Big Cypress Seminole Indian Reservation.

The map depicted below shows surface water entitlement flows going into Big Cypress Seminole Indian Reservation (**Figure 4-54**). The Seminole Tribe's current entitlement deliveries will not be changed when the A-1 FEB is operational. A-1 FEB operations will have no effect on how water currently flows into Big Cypress Indian Reservation.

Figure 4-54 Water Flows into Big Cypress Seminole Indian Reservation



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4.10.3 WCA TRIBAL RIGHTS

Both the Seminole Tribe and the Miccosukee Tribe have full rights to access lands within WCA 3A to continue their TCP usage and occupancy of Federal or Federally acquired lands and waters within WCA 3A, which include hunting, fishing, trapping on a subsistence basis and Traditional Cultural Practices. Religious activities traditionally include the planting and harvesting of corn and the ceremonial Green Corn Dance conducted on tree islands. Subsistence activities include gathering of medicinal plants and natural building materials, hunting, and fishing; while commercial activities include frogging, conducting airboat and other guided tours, and providing recreational and tourism facilities within the Everglades.

The Action Alternatives would not alter, modify, or effect the Seminole Tribe or the Miccosukee Tribe's rights within WCA 3A. Alternative 2 (Shallow FEB) would result 14-30 days per year shorter hydroperiod in 11,000 acres of WCA 3A, Alternative 3 (Deep FEB) results in 14-30 days per year shorter hydroperiod in 1,000 acres, while Alternative 4 (STA) results in no change in ponding and hydroperiod in WCA 3A. The areas simulated to experience the effects are adjacent to the northern reach of the Miami Canal along the east side of the canal, while the Seminole Tribe's WCA 3A Easement is located west of the Miami Canal. The reduction in high water levels within WCA 3A is anticipated to improve environmental conditions for many of the tree islands, plants, and animals that the Tribes rely on to practice traditional and commercial activities.

4.11 RECREATIONAL RESOURCES

4.11.1 NO ACTION ALTERNATIVE

There would be no changes to recreational resources as a result of the No Action Alternative. Currently there is no authorized recreational use occurring on the A-1 site. It is possible that the SFWMD could issue new leases for agricultural use of these lands, which would result in future active production of sugar cane and other crops, limiting any recreational use on the site.

4.11.2 ACTION ALTERNATIVES

An FEB is a unique feature with a specific project purpose and function as described in Chapter 2. To date the South Florida Water Management District has not constructed nor operated a Shallow or Deep FEB. As a result, immediately following completion of construction, the project would enter an initial flooding and optimization period. During this period, various operation and management approaches would be evaluated in an attempt to maximize the project's ability to achieve its intended purposes. Until the initial flooding and optimization period is completed, explicit recreation for each of the action alternatives has not been defined and may be limited. Ultimately, the recreational opportunities afforded would need to be consistent with the project purpose and the project's operational plan; however, the intent is to offer the maximum amount of recreational opportunities that are determined to be consistent with the project purpose.

Once the initial flooding and optimization period is complete, the recreational plan for the project will be developed to maximize recreational opportunities compatible with the project purpose. Typical recreational activities considered are hiking, biking, wildlife viewing, hunting, and fishing. If applicable, public use activities will be incorporated using a phased approach and public access points will be configured with facilities to support recreational activities. When deciding which activities the SFWMD may allow, the project purpose is primary; considerations include how recreational activities affect water quality and the health and function of the vegetation community structure, as well as how water depths vary over time.

4.11.2.1 Project site

Alternative 2 (Shallow FEB) and Alternative 3 (Deep FEB)

As discussed above, once the Shallow or Deep FEB is constructed there would be a flooding and optimization period. In this time period passive recreational activities would be allowed. Once the flooding and optimization phase is complete, a recreational plan for the project would be developed to maximize recreational opportunities compatible with the project purpose.

Alternative 4 (STA)

Under the STA alternative, recreational activities would be consistent with recreational opportunities allowed in the other existing STAs (e.g., hiking, biking, wildlife viewing, hunting, and fishing). Opportunities for all these typical activities would generally increase, in comparison to the no action alternative, if the STA alternative were implemented. Many waterfowl and wading birds take advantage of other STAs in the region for nesting and foraging.

4.11.2.2 STA 2, STA 3/4, WCA 2A and WCA 3A

None of the action alternatives would have direct effects on existing recreational opportunities within STA 2, STA 3/4, and WCA-2A and WCA-3A.

Indirect effects associated with the Action Alternatives include the potential for temporary disturbance to recreational users in STA 2 and STA 3/4 while the construction of the project is ongoing. These disturbance effects would be limited to the adjacent portions of the STA and the WMAs, and would cease when construction is completed. In addition, modeling results establish that changes in flows and stages within WCA 2A and WCA 3A are very limited, and it is unlikely that these changes are of a sufficient magnitude or duration to adversely influence water related recreation in those areas.

4.11.2.3 Holey Land Wildlife Management Area

Effects to the Holy Land could occur due to construction of a discharge canal adjacent to the existing STA 3/4 Cells 3A and 3B from the STA alternative to the L-5 canal. These direct impacts to the Holy Land could cause temporary disturbance to recreational users while construction is ongoing.

4.12 AESTHETICS

4.12.1 NO ACTION ALTERNATIVE

The existing aesthetic character of the A-1 project site is similar to the EAA as a whole, as described in Section 3.12. The landscape is flat and has a predominantly uniform and organized appearance. The prior construction activities on the site have created differences in site conditions in various areas on the project site. Areas that have been scraped down exhibit natural aesthetics with functioning wetland systems, while areas that have stockpiles of rock, gravel, and much offer poor aesthetics for the area. Other low quality aesthetic areas of the site contain wetlands dominated by exotic plant species. Under the No Action Alternative (Alternative 1), the aesthetics would be converting those various areas to agricultural lands if the site would resume agricultural activities.

4.12.2 ACTION ALTERNATIVES

Action Alternatives 2, 3, and 4 would result in construction and operation of new impoundments that would cover approximately 15,000 acres that would be inundated on a permanent basis. This long-term operating condition would change the visual character of the landscape in the immediate vicinity of the proposed project. This direct effect at and near the project site would be the primary aesthetic impact of the proposed project.

Based on the nature of the sources of change, potential aesthetic effects from the Action Alternatives would be the same. Any of the Action Alternatives would involve an initial period when construction would be evident to people within viewing range of the project sites. Views of construction equipment, dust plumes, exposed excavations, and partially completed culverts and other structures would be visible to residents and workers who pass near the construction sites in the course of their regular activities, and to motorists traveling on roads adjacent to the project sites. These views would be temporary in nature.

Once the project is in operation, the long-term appearance of the project site for Alternatives 2 (Shallow FEB) would consists of expansive emergent vegetation and Alternative 4 (STA) would consist of expansive emergent and submerged vegetation. Alternative 2 (deep FEB) would consist of expansive open water areas. All of the alternatives would provide views of the aquatic systems bordered by a variety of constructed features, including levees; roads along the tops of the levees; and water control structures, culverts, and pump stations spaced at varying intervals. However, the constructed features (e.g., levees, roads, water control structures, etc.) will be noticeable by those passing by the site. The view of the aquatic habitats would be noticeable to those on the levee system. Although the future condition with the project would result in less overall visual diversity, the presence of additional water area would likely be perceived as a positive change or of more visual interest when compared with the current condition (Hettinger 2005, as cited in URS 2007a,b). On balance, the long-term aesthetic change resulting from the project would not be a significant adverse impact.

4.13 FLOOD PROTECTION

4.13.1 NO ACTION ALTERNATIVE

Under the No Action Alternative the existing level of flood protection would be maintained as it currently is today with no impacts to the project site, STA 2, STA 3/4, WCA 2A, WCA 3A or Holey Land.

4.13.2 ACTION ALTERNATIVES

4.13.2.1 Project Site

None of the Action Alternatives are expected to impact the existing level of flood protection within the C&SF System.

Both the shallow FEB and the STA alternatives are a closed system with the only hydraulic inputs being water delivered by pumps or direct rainfall. Based on Design Criteria Memorandum one (DCM-1), and a Levee Breach Analysis conducted for the Shallow FEB, the Shallow FEB alternative has been designated a low hazard potential classification. Inundation mapping performed during the analysis has shown at maximum water level a levee breach would not reach the travel lanes of U.S. 27 or overtop the north STA 3/4 levee; therefore, there is no impact to the existing level of flood protection service. Since the levee height and maximum water depths for the STA alternative are similar to the shallow FEB, no flood protection impacts are anticipated with the STA alternative. In the event of a levee breach, a potential for damage exists for adjacent private property to the north and west of the project site.

The Deep FEB alternative is classified as a high hazard potential based on the criteria outlined in DCM-1. A seepage cutoff wall would be required within the perimeter embankment as well as a perimeter seepage canal to reduce and capture seepage from the Deep FEB. In the event of a levee breach additional conveyance would be required on the west side of U.S. 27 to allow for flood waters to get away and not impact the travel lanes or overtop STA 3/4. Adjacent private agriculture property would experience damage to the north and west of the project site if a breach or overtopping of the Deep FEB levees were to occur.

4.13.2.2 STAs 2 and 3/4, WCAs 2A and 3A, and Holey Land Wildlife Management Area

No impacts to the existing level of flood protection in STAs 2 and 3/4, WCAs 2A and 3A, and Holey Land would be expected with the Action Alternatives.

4.14 HAZARDOUS AND TOXIC WASTE

4.14.1 NO ACTION ALTERNATIVE

The current land use within the A-1 project site is inactive agricultural lands. Under the No Action Alternative, the land use would remain primarily fallow agricultural lands; however, agricultural activities may become active. There would be the potential for release of petroleum or agricultural chemicals in these areas with active agricultural land use. Additionally, large areas of the property have been scraped of the soil and the soil has been stockpiled in berms and discrete stockpiles throughout the property. These stockpiles represent an increased potential for erosion into adjacent waterways.

4.14.2 ACTION ALTERNATIVES

Current areas of known contamination are described in Chapter 3 of this document. One area where the project may encounter contaminant concentrations exceeding ecological risk thresholds with Alternatives 2 (Shallow FEB), Alternative 3 (Deep FEB) and Alternative 4 (STA) is the southern portion of Tract #100-039 (Woerner Farm 3), where toxaphene impacted soils were previously identified. Tract #100-039 consists of approximately 966 acres of land; however, only approximately 330 acres of the property will be used within project footprint, plus a small area to the northwest of the project footprint that will be used for a construction yard. This southern portion of Tract #100-039 within the project footprint has been scraped of soil and part of the seepage ditch that was constructed for the EAA reservoir. Additional sampling is required on this tract to verify that toxaphene concentrations in the remaining soils are below ecological risk thresholds and to verify the disposition of the scraped soils. Therefore, this area will be sampled prior to project construction. Any contaminated soils exceeding the threshold will be removed and relocated outside the project footprint.

Tract #100-104 (Talisman South Ranch) contains areas with elevated levels of copper and arsenic. This area completed remediation of all of the point source areas. The known areas within Tract #100-029 (Talisman Mill) where contaminated soils have been consolidated and capped will be within the A-1 FEB footprint. These areas will not be disturbed during construction. Construction of a reservoir over these areas was previously evaluated by FDEP, which concluded that these areas would not impact the project and the capped areas prevent exposure to wildlife or people, as long as the cap remains in place above the contaminated soils.

The USFWS has provided concurrence that no significant ecological risks associated with residual agrochemicals are present on Tracts #100-105 and #100-020. The USFWS issued separate concurrence on the entire A-1 FEB project site by letter dated April 17, 2013 (Appendix J), pending confirmation on remediation of toxaphene impacted soils from the lower 1/3 of the Woerner Farm 3 property and with the understanding that the SFWMD will implement a USFWS-approved start-up monitoring plan for copper which includes surface water, periphyton, and apple snails should they occur onsite.

A Site Rehabilitation Completion Order was issued by FDEP on July 21, 2006 under FDEP Facility ID number 50/8514728.

Due to the ubiquitous nature of arsenic throughout the EAA, all Action Alternatives could result in the generation of excess soils which contain arsenic at concentrations exceeding the FDEP residential soil cleanup target levels (SCTLs), but below commercial SCTLs or ecological risk thresholds. As these levels are below the ecological risk threshold, use of these soils on-site will result in a low ecological impact. It is currently anticipated that all soils will remain on site and utilized in construction of the levees. If excess soils are disposed off-site, they will be utilized in compliance with state and federal requirements and regulations.

The Action Alternatives would include the use of heavy equipment for construction of the proposed project and associated structures. Operation of this equipment may result in the release of petroleum products, such as fuel and hydraulic fluid. Fueling areas may experience spills when equipment and tanks are filled or possible spills from fuel tank leaks. The use of equipment could result in the release of hazardous and toxic materials or waste into the project area. However, Best Management Practices (BMP) would be implemented during construction to reduce the risk of release of hazardous or toxic materials or waste.

4.15 CLIMATE

Implementation of the No Action and the Action Alternatives would have no measureable effect on the climate in south Florida.

4.16 COSTS

No Action and Action Alternatives

For the purposes of this EIS, cost estimates for each alternative are a rough order of magnitude based on the primary components that comprise each alternative. Therefore costs are confined to the build alternatives themselves for the project footprint. Since no construction is anticipated downstream in STA 2 and STA 3/4 or in WCA 2A and WCA 3A with any of the alternatives, a cost analysis is not applicable in these areas.

The cost estimate for each alternative is based on the alternative description of major components as outlined in Chapter 2, Section 2.4 Description of Alternatives. There is a certain amount of sunk costs (costs already incurred) within each alternative associated with the previous construction from the EAA A-1 Reservoir. These are defined as sunk costs for the land and initial earthwork that was conducted. **Table 4-15** contains each of the Alternatives listing total cost, sunk costs and estimated new construction costs. Of the alternatives (2, 3 and 4) that are projected to meet the WQBEL at both STA 2 and STA 3/4), Alternative 2 is the least expensive.

The difference in construction cost between the Shallow and Deep FEBs results from the needed additional excavation for the Deep FEB for an inflow pump station and fill material for larger levees, as well as the seepage cutoff wall and additional protection features needed for flood protection (see also Section 4.13.2.1). The STA would require additional levees to separate the EAV and SAV cells; as well as a new discharge canal within Holey Land.

Table 4-15 Estimated Costs of All Alternatives

Alternative	Sunk Cost	Estimated Construction Costs	Total Cost
1 - No Action	$180,000,000	$0	$180,000,000

2 - Shallow FEB	$180,000,000	$60,000,000	$240,000,000
3 - Deep FEB	$180,000,000	$593,000,000	$773,000,000
4 - STA	$180,000,000	$288,000,000	$468,000,000

4.17 ENVIRONMENTAL JUSTICE

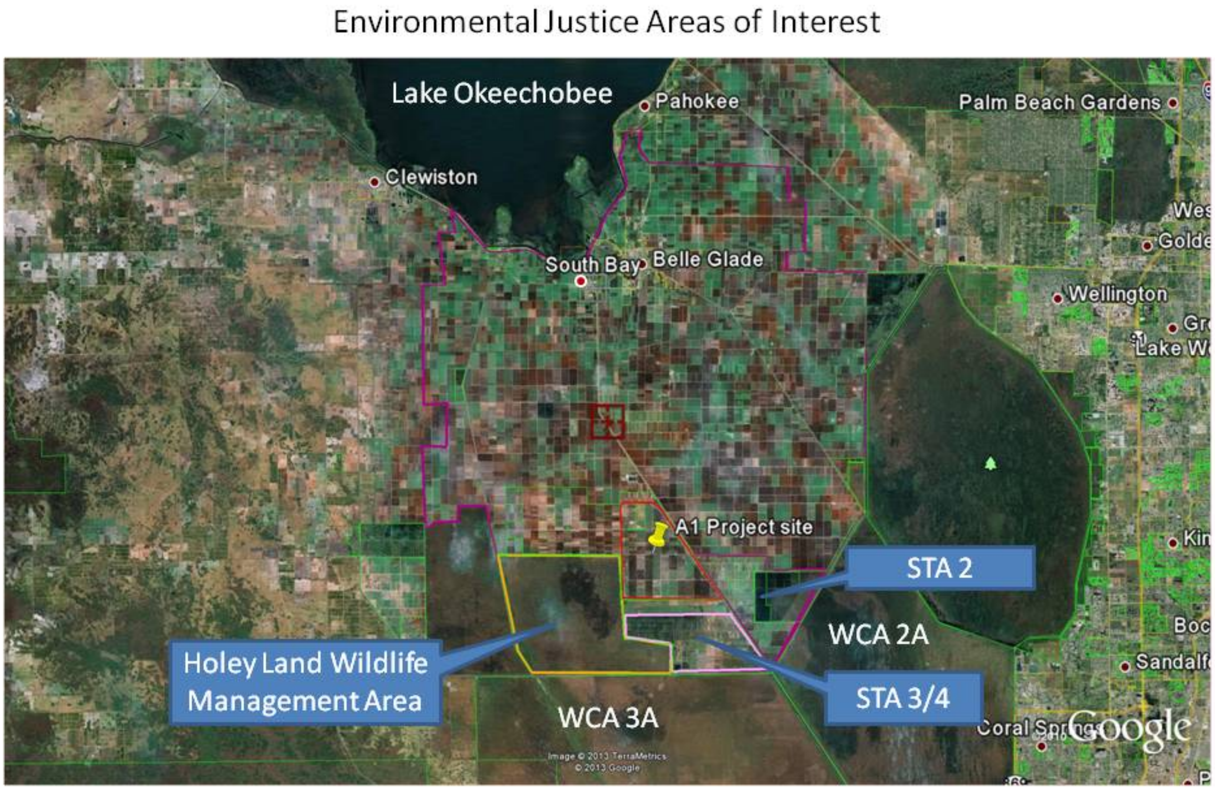
The Environmental Protection Agency (EPA) defines environmental justice, as fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, or commercial operations, or the execution of federal, state, local, and tribal programs and policies. Meaningful involvement means that potentially affected community residents have an appropriate opportunity to participate in decision making about a proposed activity that will affect their environment and/or health (EPA website at www.epa.gov/region4/ej).

In accordance with Executive Order 12898, the Federal government reviews the effects of their programs and action on minorities and low income communities. This is accomplished by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The following potential environmental justice issues have been identified for a water storage facility in the EAA:

- Displacement of minority or low income inhabitants of land within the footprints of land purchases required for each of the project alternatives.
- Flooding or related environmental issues that would impact minority groups or low income class groups as a result of change in conveyance of water.
- Loss of jobs for low income and minority workers as a result of implementing the project.

The scope of analysis for the A-1 project site includes the EAA, STA 2 and STA 3/4, WCA 2A and WCA 3A, and Holey Lands. These areas do not contain residential communities. The closest areas with minority or low income communities are north of the EAA, Belle Glade and South Bay, which are 14 and 13 miles north (upstream) of the project site, respectively (**Figure 4-55**).

Figure 4-55 Environmental Justice Areas of Interest



According to the United States Census Bureau data of 2011, Belle Glade contains 21,815 people residing in the city. The racial makeup of Belle Glade is 4.7% White, 27.0% Hispanic or Latino origin, 62.7% African American, 0.3% Native American, 0.5% Asian, and 5.4% some other race. There are 6,324 households in Belle Glade with a median household income of $28,406 per year. About 38.4% of the population is below the poverty line, of which 47.4% are under the age of 18 and 28.8% are over the age of 65. The US Census data states the per capita income is $4,995, which is the lowest ranked city/town in the state of Florida (887 out of 887). The zip code in Belle Glades is 33430.

Also according to the United States Census Bureau data of 2011, South Bay contains 4,901 people residing in the city. The racial makeup of South Bay is 10.0% White, 23.3% Hispanic or Latino, 64.2% Black or African American, 0.4% Asian, 0.6% Native Hawaiian and other Pacific

Islander, and 3.3% from some other races. There are 779 households in South Bay with a median household income of $25,663 per year. About 42.9% of the population is below the poverty line, of which 54.9% are under the age of 18 and 36.5% are over the age of 65. The 2010 US Census data states the per capita income is $9,126, which is ranked (866 out of 887). The zip code in South Bay is 33493.

The Action Alternatives would not have a disproportionately high and adverse human health or environmental effects on minority or low income populations. Displacement of minority or low-income inhabitants will not occur with any Alternative as the lands do not support housing. In addition, land that has historically been used for agriculture would be used water quality purposes on the A-1 project site. Therefore, there would be a loss in agricultural lands and a loss of agricultural jobs. Recreational benefits are a potential use for each of the Action Alternatives. Socioeconomic development activities resulting from construction of the project include but are not limited to construction symposiums, contract opportunity assistance for small business involvement and job cross training for local residents. These all act to make the area more attractive to visitors and in turn, may provide jobs and subsistence for low income and minority populations of the area. Belle Glade and South Bay will not be affected by flooding or other environmental factors such as dust, offensive odors, or water pollution as the areas are located north of the project site. The project would discharge waters into an STA, which is designed to accept flood waters. The STA will in turn, discharge the treated water into WCAs. The SFWMD will implement measures to control dust during construction activities through the use of best management practices.

4.18 NATURAL OR DEPLETABLE RESOURCES

4.18.1 NO ACTION

The No Action Alternative is anticipated to have an increase in the generation of agricultural or mineral resources. The A-1 project site could be utilized for agricultural use or rock mining.

4.18.2 ACTION ALTERNATIVES

There are rock mining and/or agricultural resources that would be unavailable for exploitation as a result of construction of the Action Alternatives. Limestone and/or rock material is a common available resource in the region. The impact of the proposed project upon rock mining or agricultural resources is very minor. No other significant vegetable or mineral resource is known to exist.

4.19 CUMULATIVE IMPACTS

Evidence is increasing that the most severe environmental consequences do not result from the direct impacts of any particular action, but from the combination of impacts of multiple, independent actions over time. Section 1508.7 of the CEQ regulations defines a cumulative impact as:

> "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Principles of cumulative effects analysis, as described in the CEQ guide *Considering Cumulative Effects under the National Environmental Policy Act*, are presented in **Table 4-16**.

Table 4-16. Principles of Cumulative Impacts Analysis
Cumulative impacts are caused by the aggregate of past, present, and reasonably foreseeable future actions.
Cumulative impacts are the total impacts, including both direct and indirect impacts, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, nonfederal, or private) has taken the actions.
Cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
It is not practical to analyze the cumulative impacts of an action on the universe; the list of environmental impacts must focus on those that are truly meaningful.
Cumulative impacts on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
Cumulative impacts could result from the accumulation of similar impacts or the synergistic interaction of different impacts.
Cumulative impacts could last for many years beyond the life of the action that caused the impacts.
Each affected resource, ecosystem, and human community must be analyzed in terms of the capacity to accommodate additional impacts, based on its own time and space parameters.
Source: CEQ, 2013.

4.19.1 SIGNIFICANCE

In accordance with CEQ regulations and implementing guidance, cumulative effects are evaluated in terms of their significance. The term *significant*, as defined in 40 CFR 1508.27, part of the CEQ regulations for implementing NEPA, requires considerations of both context and intensity. Context means that the significance of an action must be analyzed in several settings, such as society as a whole, the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects on the locale rather than on the world as a whole. Both short- and long-term effects are relevant to the consideration of the significance of an effect. Intensity refers to the severity, or degree, of effect. Factors that have been used to define the intensity of effects include the magnitude, geographic extent, duration, and frequency of the effects. The following terms are used to describe the degree of direct and indirect effects, whether they are adverse or beneficial:

- No Effect or Minor Effect - the effect is either non-detectable (no effect) or slight but detectable (minor)
- Moderate – the effect is readily apparent.
- Major – the effect is severely adverse or exceptionally beneficial.

Adverse effects can be reduced in intensity by mitigation. Mitigation in this context refers to measures taken to avoid, minimize, or offset adverse effects. For example, dust emissions generated during road building operations, whether directly caused by the movement of heavy equipment or indirectly caused by unvegetated soils exposed to wind, have the potential to cause a major effect that decreases as distance from the work increases. When BMPs are implemented, usually in response to local or county ordinances, the BMPs mitigate the effect of the dust by controlling fugitive dust emissions and reducing the intensity (magnitude, geographic extent, and frequency) of the effect to a moderate or minor level.

4.19.2 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS AFFECTING RESOURCES WITHIN THE STUDY AREA

Prior to drainage and compartmentalization, the Everglades were a shallow wetland conveying water from Lake Okeechobee to the southern coast of Florida. The Everglades Drainage District, encompassing 7,150 square miles, was created in 1907 by Florida Governor Napoleon Bonaparte Broward for the purpose of drainage and reclamation of the Everglades (Light and Dineen 1994). In the early 1900s, the Everglades Drainage District constructed several canals that impacted Lake Okeechobee and the Greater Everglades. By 1917, the West Palm Beach, Hillsboro, North New River and Miami Canals had been constructed (Allison et al., 1948). By 1931, the outlet from Lake Okeechobee to the Caloosahatchee River was improved, and the completion of the St. Lucie Canal east to the Atlantic Ocean provided another way of controlling lake levels. The Bolles and Cross canals became connectors to the four major canals south of

Lake Okeechobee bringing the total miles of canal excavated to 440 (Light and Dineen 1994). The Everglades Drainage District also constructed 47 miles of levees around the southern rim of Lake Okeechobee during this time (Allison et al., 1948). Within a similar time frame (1915-1928) the construction of Tamiami Trail was completed which linked Miami with Naples on the west coast. Hurricanes in 1926 and 1928 shifted attention from Everglades drainage to controlling flooding around Lake Okeechobee. In 1930, the Corps became a major participant with the state (i.e., Okeechobee Flood Control District) in controlling flooding around Lake Okeechobee. Florida agreed to share a portion of the costs to increase discharges from the lake, improve canal works, and reconstruct and enlarge the levees around it (Light and Dineen 1994). The effect of levees on the agricultural area south of Lake Okeechobee was dramatic and sugarcane production was doubled in 10 years between 1931 and 1941 (Clarke, 1977). Drainage of the Everglades and the linkage of the east and west coast, promoted urban growth in south Florida and the population escalated from 22,961 in 1900 to 228,454 by 1930 (Dietrich 1978). During the 1930s and into the 1940s, construction was abandoned and maintenance ceased on Everglades Drainage District works (Light and Dineen 1994).

Although modifications to Lake Okeechobee and the Everglades began in the early 1900s, the greatest influence on the alteration of flow was the C&SF Flood Control Project, which was originally authorized by Congress in 1948. The C&SF project was designed to lower water levels east of the eastern protective levee by 4 to 5 feet. Increased flood protection coupled with lowering of the water table east of the levee had a dramatic effect on urbanization and development and acted as a catalyst for a population explosion in south Florida. Between 1952 and 1954 the eastern perimeter levee along the WCAs was constructed from Palm Beach to Dade County in order to stop sheet flow from the Everglades toward the urbanizing eastern coastal areas (Light and Dineen 1994). Between 1954 and 1959 additional levees (L-1, L-2, L-3, L-4, L-5, L-6, and L-7) were constructed to partition the EAA from the remainder of the Everglades and the old Everglades Drainage District Canals (West Palm Beach, Hillsboro, North New River, and Miami) were deepened within the EAA to provide better flood conveyance from the agricultural area into the WCAs (Light and Dineen 1994).

Between 1960 to 1963 substantial portions of the C&SF Flood Control project were completed. Construction of the levees surrounding WCA 3 was completed by 1963 with L-67A dividing WCA 3 into two compartments, WCA 3A and WCA 3B (Light and Dineen 1994). S-151 and S-31 were also constructed during this time period. These two structures improved the discharge capacity of the Miami Canal to coastal communities (Cooper and Roy, 1991), further exacerbating the unnatural drainage of northern WCA 3A. In combination with the northern levees of WCA 3A (L-4 and L-5), the Miami Canal has substantially impacted historical sheetflow and natural wetland hydroperiods. As a result, during wet periods, the natural capability of WCA 3A to store water is lost and the Miami Canal effectively over-drains the area. These hydrologic changes have increased the frequency of severe peat fires and have also resulted in the loss of ridge and slough topography that was once characteristic of the area. Northern WCA 3A has become largely dominated by sawgrass, cattail and scattered shrubs and lacks the structural diversity of plant communities seen in central and western WCA 3A.

Completion of the L-29 levee in 1962 led to ponding in the southern portions of WCA 3A. Exacerbating this problem were the major canal systems (i.e. Miami Canal, L-67A) which accelerate the flow of water from north to south within WCA 3A, drying the north while further ponding the south (Zaffke 1983), especially along the L-67 A and L-29. As a result of this ponding, extended hydroperiods and increased water depths led to changes in vegetation communities in which wet prairies were displaced by aquatic slough communities (Zaffke 1983, Tanner et al. 1987). In addition, many tree islands within southern WCA 3A were lost due to increased water depths (Craighead 1971), with many of the remaining islands showing signs of stress. Wood and Tanner (1990) documented the trend in southern WCA 3A toward deep water lily dominated sloughs due to impoundment within the southern end of WCA 3A.

Four control structures located along the L-29 were constructed between 1960 and 1963 (S-12A, S-12B, S-12C, and S-12 D). These structures were used to regulate discharge from WCA 3A and effectively limited water releases to only the western part of Shark River Slough (Light and Dineen 1994). Construction of the L-67 C and the extension of L-67 south of Tamiami Trail were completed between 1965 and 1973 in order to facilitate water delivery from WCA 3A to ENP. Completion of the L-67 A and C canal and levee system intercepted water that would otherwise flow to WCA 3B. With its impoundment, WCA 3B became isolated from the rest of the Everglades with inflows and outflows limited to rainfall and levee seepage. Within WCA 3B, the ridge and slough landscape has become severely compromised by the virtual elimination of overland sheetflow and has largely turned into a sawgrass monoculture where relatively few sloughs or tree islands remain. Loss of sheetflow to WCA 3B has also accelerated soil loss reducing elevations of the remaining tree islands in WCA 3B, making them vulnerable to high water stages. With the construction of WCA 3A, WCA3B and the extension of the L-67, flows to ENP became subject to water supply deficits during the dry season and excesses during the wet season, resulting in a decline in ecological quality. By 1973 the C&SF project in the Everglades was essentially complete.

Among the first Congressional actions to offset adverse impacts to ENP by improving the supply and distribution of water, was the Flood Control Act of 1968, which provided for modifications to the C&SF Project through the implementation of the ENP South Dade Conveyance System (SDCS). Additional Congressional actions ensued, including the ENP Protection and Expansion

Act of 1989, which expanded ENP to incorporate the Northeast Shark River Slough and the East Everglades into the Park's boundary for protection and restoration of the natural hydrologic conditions within ENP. This Act also provided authorization for development of the Modified Water Deliveries (MWD) to ENP project. The goal of the MWD Project was to improve water deliveries into ENP and, to the extent practicable, take steps to restore the natural hydrologic conditions within ENP. The Water Resources Development Act (WRDA) of 2000 established CERP to provide for the restoration, protection and preservation of the water resources of central and southern Florida, including the Everglades and Florida Bay (USACE 1999).

CERP contains 68 components that include approximately 217,000 acres of new reservoirs and wetlands-based water treatment areas. A number of operational components have also been identified in CERP and will, in most cases, occur in conjunction with related construction features. The operational features in CERP include: a modified Lake Okeechobee regulation schedule; environmental water supply deliveries to the Caloosahatchee and St. Lucie Estuaries' modifications to the regulation schedules for WCAs 2A, 2B, 3A, 3B, and the current rainfall delivery formula for ENP; modified Holey Land Wildlife Management Area Operation Plan; Modified Rotenberger Wildlife Management Area Operations Plan; a modification for coastal well field operations in the Lower East Coast (LEC); LEC utility water conservation; and operational modifications to the southern portion of L-31 and C-111. These features will result in significant environmental benefits to the CERP project area, improving the quantity, quality, timing and delivery of water to the natural system. Construction has begun on the first generation of CERP project modifications already authorized by Congress. Second generation of CERP projects is awaiting Congressional authorization. However, none of these projects will alter water flow or water quality within the study area.

Non-CERP projects that are considered reasonably foreseeable, which may affect resources within the study area, include projects under the Restoration Strategies Regional Water Quality Preliminary Plan (SFWMD 2012) for either the Western, Central or Eastern Flowpaths. The Restoration Strategies Regional Water Quality Preliminary Plan describes resulting projects developed to address water quality concerns associated with discharges from the STAs to the EPA to achieve water quality standards established for the Everglades. Overall, the SFWMD is implementing a technical plan to complete eight projects that will create more than 6,500 acres of new STAs, 110,000 acre feet of additional water storage through construction of FEBs, and 800 acres of earthwork within the existing STAs to maximize effective treatment area. Design and construction of the treatment and storage projects will be completed in three phases over a 12 year timeframe, with completion set for 2024.

The C&SF Project has numerous water management structures consisting of culverts, spillways, and pump stations that have specified operating criteria for managing or regulating water levels for Congressionally-authorized project purposes. Regulation schedules have been, and will continue to be, designed to balance multiple, and often competing, project purposes and objectives. Managing for better performance of one objective often lessens the effectiveness of performance of competing objectives. For example, for Lake Okeechobee, higher regulation schedules tend to benefit water supply, but may increase the risk to public health and safety, and can harm the ecology of the lake. Lower lake schedules may produce lake levels more desirable for the lake ecology and improved flood protection, but reduce water supply potential.

Since April 2008, Lake Okeechobee has been operated in accordance with the 2008 Lake Okeechobee Regulation Schedule (2008 LORS). Prior to the 2008 LORS, Lake Okeechobee operations were managed under the “Water Supply and Environment (WSE) Regulation Schedule” since July 2000. The 2008 LORS operational study was initiated to address high lake levels, high estuarine discharges, estuary ecosystem conditions, and lake ecology conditions that occurred during the 2003 to 2005 time period. The study considered the back-to-back historically significant 2004 and 2005 hurricane seasons’ effects on the recognized structural integrity issues of HHD along with effects to other project purposes. The 2008 LORS was identified to be effective at decreasing the risk to public health and safety, reducing the number of high-volume discharges to the estuaries, and providing critical flexibility to perform water management operations. When it was approved, LORS 2008 was identified as an interim schedule. A subsequent schedule would be considered after the modifications to the Herbert Hoover Dike were completed.

In addition to CERP and non-CERP projects previously specified, another current project includes the Everglades Restoration Transition Plan (ERTP) for WCA 3A, ENP, and the SDCS, which has replaced the Interim Operational Plan (IOP) for protection of the Cape Sable seaside sparrow (CSSS). From July 2002 through October 2012, WCA 3A was regulated according to a seasonally varying 8.75 to 10.75 feet, NGVD regulation schedule and the Rainfall Plan (initiated in 1985), as per IOP. The primary objective in implementing IOP was to adhere to a 1999 USFWS Jeopardy Opinion to reduce damaging high water levels within CSSS habitat west of Shark River Slough (i.e. CSSS-A). The purpose of IOP was to provide an improved opportunity for CSSS nesting by maintaining water levels below ground level for a minimum of 60 consecutive days between March 1 and July 15, corresponding to the CSSS breeding season. In addition, a secondary purpose of IOP was to allow CSSS habitat to recover from prolonged flooding during the mid-1990s. The ERTP superseded the IOP in October 2012 and is intended to define water management operating criteria for the C&SF project features and constructed features of the

MWD and Canal-111 South Dade Projects until a Combined Operational Plan (COP) is implemented. ERTP objectives include improving conditions in WCA 3A for the endangered Everglade snail kite, wood stork and wading bird species while maintaining protection for the endangered CSSS and Congressionally-authorized purposes of the C&SF Project.

In November 2011, the USACE initiated an expedited planning process referred to as the Central Everglades Planning Project (CEPP). The goal of CEPP is to implement a suite of restoration projects in the central Everglades to prepare for congressional authorization, as part of the CERP. CEPP would evaluate and develop incremental project components that focus restoration on more natural flows into and through the central and southern Everglades. The project objectives include capturing water currently being discharged to northern estuaries and re-direct south to benefit the Everglades. This would be accomplished by re-establishing the hydroperiods and hydropatterns that characterize the River of Grass project by (1) increasing storage, treatment, and conveyance of water south of Lake Okeechobee, (2) removing and/or plugging canals and levees within the central Everglades, and (3) retaining water within ENP and protect urban and agricultural areas to the east from flooding, Implementation of CEPP would allow more water to be directed south to the central Everglades, Everglades National Park and Florida Bay while protecting coastal estuaries projects on land already in public ownership

Relationship with Central Everglades Planning Project

CEPP will be implemented by the USACE with the SFWMD as the non-federal sponsor. While implementation of CEPP would allow more water to be directed south to the central Everglades, the A-1 Shallow FEB would only accept water that is currently being discharged south from Lake Okeechobee and would not capture water that would is currently being discharged from Lake Okeechobee to tide. Furthermore, the A-1 Shallow FEB project is not a project component of CEPP as it is proposed to be constructed and operated solely by the SFWMD.

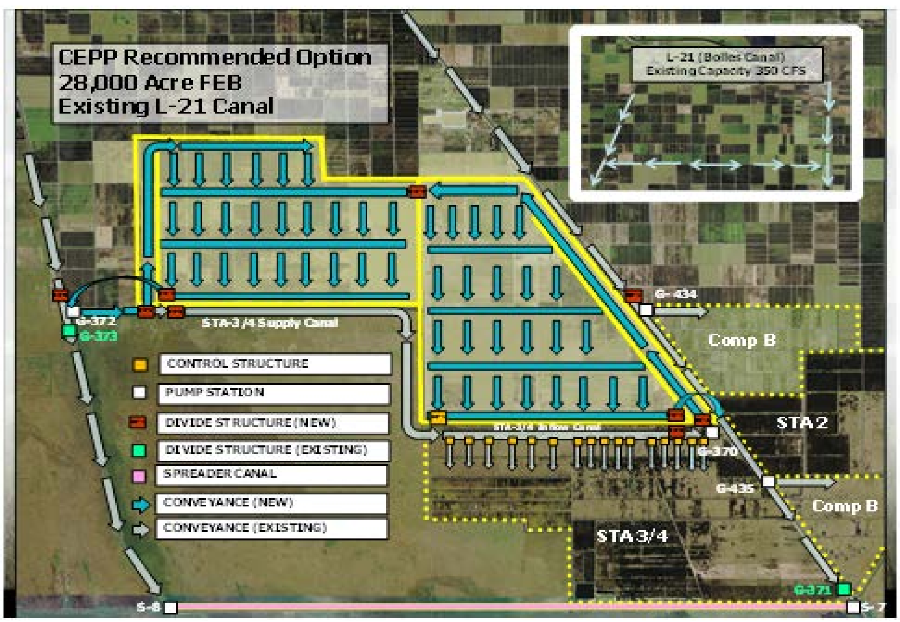
CEPP recognizes the SFWMD's plans on the A-1 parcel and considers the operation of the A-1 Shallow FEB in the planning process. CEPP assumes that the SFWMD's A-1 Shallow FEB will be constructed separately from the CEPP projects, will be constructed prior to the CEPP projects, and would be operated as an FEB regardless of whether the CEPP project received Congressional approval. Therefore, the SFWMD's A-1 Shallow FEB is included in the baseline condition of the alternatives analysis referred to as the CEPP Future Without Project.

Integrated Operations of the FEB (parcels A-1 and A-2)

The screening conducted for CEPP storage and treatment options, to deliver "new" water to the Everglades, resulted in the identification of a 28,000 acre FEB as the option that reasonably maximizes benefits while minimizing costs. This configuration proposes a shallow FEB on the A-2 footprint that would operate in conjunction with the SFWMD's A-1 Shallow FEB project (See **Figure 4-56**). The maximum operating depth within the proposed CEPP FEB design is 4 feet. The Recommended Option is projected to provide approximately 200,000 ac-ft per year (average annual value) of additional flow (which is currently being discharged to tide via the St. Lucie Canal and Caloosahatchee River) to the Everglades.

The SFWMD's A-1 Shallow FEB was designed to accept existing EAA runoff and current Lake Okeechobee releases in order to provide water to STA 2 and STA 3/4 in an optimized way. The SFWMD's A-1 Shallow FEB is not proposed to be continually operated at four feet at all times, although this would normally occur during the wet season. Therefore, the A-1 FEB will have capacity to accept and treat additional water from Lake Okeechobee during off-peak times, such as the dry season. CEPP formulation considers potential benefits from using the available capacity in the A-1 FEB, STA 3/4 and STA 2 during the dry season for additional water storage.

Figure 4-56 Conceptual Layout of CEPP Integrated FEB on A-1 and A-2 project site



For the A-2 FEB, a new divide structure would be proposed to be constructed at the northwest corner of the A-1 Shallow FEB. When in operation, the new divide structure could allow for a transfer of water between the A-1 and the A-2 FEBs enabling them to operate in conjunction with one another. The public will have the opportunity to review and comment on the CEPP project, including the A-2 FEB through a series of public workshops sponsored by the South Florida Ecosystem Restoration Task Force. Details of the public workshop can be found at: http://www.sfrestore.org/cepp/cepp.html Additional details of the CEPP project will be provided in the upcoming CEPP EIS. Information on CEPP can be found on the USACE's website at: http://evergladesplan.org/pm/projects/proj_51_cepp.aspx

4.19.3 DETAIL OF ANALYSES

As stated in the CEQ regulations (1501.1):

> "following scoping, the preparing agency should determine the scope (Sec. 1508.25) and the significant issues to be analyzed in depth in the environmental effect statement. Identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3), narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere."

As described in Chapter 1, following scoping, issues that were not believed to be significant were eliminated from detailed study. These topics include Essential Fish Habitat, Air Quality, Noise Pollution, Transportation, and Water Supply/Drinking Water. Issues, or resource categories, not eliminated from detailed study included: Land Use, Geology, Topography and Soils; Hydrology (Overall Water Management, Surface Water Hydrology; Groundwater Hydrology, STA Phosphorus Removal); Water Quality; Vegetation (General Vegetation and Wetlands); Fish and Wildlife (Overall Fish and Wildlife, Federally Listed Threatened or Endangered Species, State Listed Threatened or Endangered Species, Migratory Birds); Cultural, Historic, and Archaeological resources; Tribal Rights; Recreational Resources, Aesthetics; Flood Protections; Hazardous and Toxic Waste; Climate; Costs; Environmental Justice, and Natural or Depletable Resources.

In accordance with CEQ guidance (CEQ, 1997), this analysis of cumulative effects is focused on those resource categories determined to be significant. Identification of the resource categories for which there may be significant cumulative effects began with defining the direct and indirect effects of the current action on the resources categories (see Sections 4.3 through 4.18). The resource categories were then considered in terms of their importance nationally, regionally, and locally. After consideration of the direct and indirect impacts of the current project and the above described reasonably foreseeable projects and considering comments received during the scoping and draft EIS comment periods, the resource categories determined to have significant potential cumulative impacts are:

- Hydrology
- Threatened and Endangered Species;
- Fish and Wildlife Resources
- Surface Water Quality
- Ecological Resources (Vegetation and Wetlands)
- Cultural, Historic, and Archaeological resources;

Although geology, groundwater hydrology, fish and wildlife values, migratory birds, aesthetics; flood protection, hazardous and toxic waste, climate; costs, and environmental justice were considered in detail for direct and indirect effects, they are not part of the cumulative effects analysis in this section. This decision was based on the factors described above, including the degree and significance of the direct and indirect effects, the resources, ecosystems, and human communities that may be affected, and the relative importance of the issues. **Table 4-17** describes the potential cumulative effects as a result of past, present, proposed, and future actions.

Table 4-17 Potential Cumulative Effects

Hydrology	
Past Actions	Flood and water control projects have greatly altered the natural hydrology.
Present Actions	Federal and state agencies are coordinating on and implementing projects to improve hydrology.
Proposed Action	• No change in discharge from Lake Okeechobee to the Northern Estuaries. • Significant beneficial hydrologic effects are anticipated to the hydrology of STA 2 and STA 3/4 produced by utilization of the Shallow FEB to attenuate flows during high storm events and to provide water to the STAs to ensure longer, more consistent hydroperiods. • No significant change in hydrologic conditions due to changed depths or resulting hydroperiods in either WCA 2A or WCA 3A.
Future Actions	• Reductions in high discharge events from Lake Okeechobee to the Northern Estuaries. • Significant beneficial hydrologic effects are anticipated within the Greater Everglades through restoration of southerly flow and rehydration of previously drained areas. • Improved hydrologic conditions by increasing depths and resulting hydroperiods in WCA 3A, WCA 3B, and ENP.
Cumulative Effect	The cumulative effect upon enactment of the A-2 FEB would be equivalent to the effect of the A-2 FEB project itself. There is no synergistic or aggregated cumulative effect that would negatively impact hydrology as the A-1 FEB would be incorporated into the baseline effects of the A-2 project and all effects disclosed through the analysis of the A-2 project. Natural hydrologic conditions would not be fully restored to pre-drainage conditions. However, improved hydrology would occur with the A-1 and A-2 site operating more frequently at or near 4-feet of water, STA-2 and STA 3/4 having longer hydroperiods and few dry outs

	periods, and the WCAs would have improved hydroperiods as well.
Threatened and Endangered Species	
Past Actions	Water management practices and urbanization have resulted in the degradation of existing habitat function and direct habitat loss leading to negative population trends of threatened and endangered species.
Present Actions	Ongoing efforts have been made by Federal and state agencies to implement projects to improve hydrology within the project area. Ongoing projects such as IOP have been implemented to maintain CSSS populations. ERTP implementation represents a paradigm shift from single species to multi-species management. The FWS recovery plan is used as a management tool.
Proposed Action	may affect, but is not likely to adversely affect the Audubon's crested caracara, the wood stork, the Florida panther, and the Everglades snail kite, and may affect the eastern indigo snake. The proposed project would not adversely modify the designated critical habitat for the Everglades snail kite.
Future Actions	Ongoing projects would be implemented to protect threatened and endangered species within the project area. ERTP includes performance measures specifically directed at managing water levels and releases for the protection of multiple species and their habitats within the project area.
Cumulative Effect	Habitat improvement, monitoring and management of threatened and endangered species are anticipated to allow populations to be maintained. Improvement of degraded populations is expected to be facilitated by the restoration and enhancement of suitable habitat through efforts to restore more natural hydrologic conditions within the project area
Fish and Wildlife Resources	
Past Actions	Water management practices have resulted in aquatic vegetation community changes and a resultant disruption of aquatic productivity and function that has had repercussions through the food web, including effects on wading birds, large predatory fishes, reptiles and mammals.
Present Actions	Ongoing efforts have been made by Federal and state agencies to implement projects to improve hydrology within the project area to restore habitat conditions for fish and wildlife resources.
Proposed Action	• There would be a moderate to major improvement to fish and wildlife resources within the A-1 site. • No change in discharge events to the Northern Estuaries is anticipated, therefore, there would be no improvement for suitable habitat for key indicator species such as oysters in the estuary. • There would be a minor beneficial effect on fish and wildlife values within the STAs as they remain hydrated for longer portions of the year. • There would be a minor improvement of fish and wildlife values within the WCAs over time as improved water quality has a positive effect on the spatial extent of suitable habitat. • Any increases in forage prey availability (crayfish, other invertebrates, and fish) would directly benefit amphibian, reptile, small mammal, and wading bird species. • Nesting and foraging activities of resident bird species may be moderately improved on the A-1 site and on any of the areas where improved hydrology or water quality allows for growth of suitable habitat.

Future Actions	• There would be a minor effect to fish and wildlife values within Lake Okeechobee. • There would be a moderate to major improvement to fish and wildlife resources within the A-2 site. • Reductions in the number of high discharge events to the Northern Estuaries are anticipated to moderately improve suitable habitat for key indicator species such as oysters. • There would be a major improvement of fish and wildlife values within the WCA 3A, 3B, and ENP due to rehydration within previously dry areas that would increase the spatial extent of suitable habitat. • Any increases in forage prey availability (crayfish, other invertebrates, and fish) would directly benefit amphibian, reptile, small mammal, and wading bird species. • Nesting and foraging activities of resident bird species are anticipated to be significantly improved. • Increased freshwater flows to Florida Bay would aid in improving suitable habitat for pink shrimp, juvenile spotted sea trout, sea turtles, manatee and crocodiles among other species.
Cumulative Effect	The cumulative effect upon enactment of the A-2 FEB would be equivalent to the effect of the A-2 FEB project itself. There is no synergistic or aggregated cumulative effect that would negatively impact fish and wildlife values as the A-1 FEB would be incorporated into the baseline effects of the A-2 project and the effects of the A2 become the cumulative effects disclosed through the analysis of the A-2 project. Habitat improvement efforts would be expected to have a moderate to major positive effect on fish and wildlife values.
Vegetation and Wetlands	
Past Actions	Drainage of Florida's interior wetlands, conversion of wetlands to agriculture, and urban development has reduced the spatial extent and quality of wetland resources.
Present Actions	Efforts are being taken by state and Federal regulatory agencies to reduce wetland losses.
Proposed Action	• No effect on vegetation in Lake Okeechobee as there is no change in water flow from Lake Okeechobee that might affect the vegetation. • There would be a moderate to major improvement to wetland function within the A-1 site. • There would be a minor to moderate beneficial effect on wetland function within the STAs as they remain hydrated for longer portions of the year. • There would be a minor improvement of wetland function within the WCAs over time as improved water quality has a positive effect on the spatial extent of suitable habitat.
Future Actions	• Minor effects to vegetation within Lake Okeechobee are anticipated due to implementation of the CEPP components. • There would be a moderate to major improvement to wetland function within the A-2 site. • Reductions in the number of high discharge events to the Northern Estuaries are anticipated to improve conditions for seagrass beds. • There would be a moderate beneficial effect on wetland function within the STAs as they remain hydrated for longer portions of the year. • There would be a moderate improvement of wetland function within the WCAs over time as improved water quality has a positive effect on the spatial extent of suitable habitat. • Improved hydroperiods and sheetflow within WCA 3A, 3B and ENP would result in reduced soil oxidation, promoting peat accretion necessary to rebuild the complex

	mosaic of habitats across the landscape. • Increased freshwater flows to Florida Bay would aid to lower salinity levels, benefiting mangrove communities and seagrass beds. Some level of improvement to vegetative communities is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality and distribution of freshwater flow to the study area. More natural hydrology as part of the CERP would assist in restoring natural plant communities.
Cumulative Effect	The cumulative effect upon enactment of the A-2 FEB would be equivalent to the effect of the A-2 FEB project itself. There is no synergistic or aggregated cumulative effect that would negatively impact wetland functions as the A-1 FEB would be incorporated into the baseline effects of the A-2 project and the effects of the A2 become the cumulative effects disclosed through the analysis of the A-2 project. While the spatial extent of natural plant communities in the combined FEB areas, STAs 2 and 3/4, and the WCAs would not be restored to historic proportions, the quality of vegetative communities would be improved and the quantity of wetland habitat would increase.
Water Quality	
Past Actions	Water quality has been degraded from development and agriculture.
Present Actions	Efforts to improve water quality from agricultural areas are ongoing. State and Federal projects would temporarily elevate localized levels of suspended solids and turbidity.
Proposed Action	Placing a Shallow FEB on the A-1 site would have a moderate improvement on the water quality as the discharges from STA 2 and STA 3/4 would be expected to meeting the WQBEL at discharges from the STAs into the Everglades Protection Area.
Future Actions	Placing a Shallow FEB on the A-2 site would have a moderate improvement on water quality as additional water could be routed south from Lake Okeechobee that would have otherwise been discharged to tide, which would have negatively affected the northern estuaries. Implementation of the A-2 Project would likely result in no additional exceedances of the Everglades Settlement Agreement as compared with the current operational plan. Water quality changes potentially affects fish and wildlife resources by altering vegetation composition or structure. Aggressive actions by the State of Florida would decrease pollutant concentration and loadings to the project area. If authorized in the next Water Resources Development Act (WRDA), the Broward County WPA Project, (report approved in 2007) would reduce storm runoff deliveries to WCA-3 and improve water quality coming across into the Trail.
Cumulative Effect	The cumulative effect upon enactment of the A-2 FEB would be equivalent to the effect of the A-2 FEB project itself. There is no synergistic or aggregated cumulative effect that would negatively impact water quality as the A-2 FEB would be operating in tandem with the A-1 project and the effects of the A2 become the cumulative effects disclosed through the analysis of the A-2 project. While additional water would be routed south and stored on the A-1 Site, the A-2 Site, and within STA 2 and STA 3/4, meeting water quality at the STA discharge points would be a requirement of existing permits. While anthropogenic effects on water quality are unlikely to be eliminated, water quality is expected to slowly improve over existing and recent past conditions.
Cultural Resources	
Past Actions	Flood and water control projects, conversion of wetlands into agriculture and urban development have had adverse unmitigated effects to cultural resources either directly or indirectly.

Present Actions	Ongoing efforts have been made by Federal and state agencies to implement projects to improve hydrology within the project area, thereby stabilizing the tree islands which are known to have a high potential for cultural resources. Investigations mandated in the Programmatic Agreement for ERTP are in the process of being completed.
Proposed Action	• There are no known cultural resources within the A-1 Site. Therefore, there are no impacts to cultural resources expected. • The minor change in hydroperiod within the WCAs is expected to be so minor that no effect is expected by the proposed project's impacts on cultural resources sites eligible for listing with the NHPA.
Future Actions	• Continued improvement to hydroperiods and sheetflow within WCA 3A, 3B and ENP could reduce soil oxidation, which could stabilize the environment, and this in turn could stabilize tree islands containing cultural resources. Investigations mandated in the Programmatic Agreement for ERTP are in the process of being completed and will determine the effects of fluctuating water on subsurface historic properties. • While the effects of CEPP, and specifically the A-2 project have been evaluated, a final determination of effects on cultural resources is not complete. Consultation with stakeholders, including the State Historic Preservation Office, Advisory Council on Historic Preservation, Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida is currently ongoing.
Cumulative Effect	Cumulative effects to historic properties and culturally significant sites will be potentially major long-term adverse effects. Mitigation measures for effects to historic properties could reduce the cumulative effect to be minor long-term adverse effects.

4.20 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under NEPA guidelines, the EIS analysis includes a discussion on irreversible and irretrievable commitment of resources as it pertains to the Action Alternatives. An irreversible commitment of resources refers to effects to the resources that cannot be reversed or that would not be reversed in a foreseeable amount of time. An example would be when a species becomes extinct. Irretrievable commitment of resources describes a resource that is lost for a period of time or as long as the action exists. For example, fishing productivity would be lost in an area closed to be converted to oil exploration for as long as the oil exploration remains.

Action Alternatives 2, 3, and 4 would result in the conversion of 10,820.3 acres of wetlands to manipulated wetlands. Existing wetlands that are located in areas where placement of fill would occur (construction of levees and filling canals) would be irreversibly lost; however, land, including wetlands within the impoundments, would be converted or would remain wetland or waters. Temporary, and possibly permanent, displacement would occur for some natural and human resources during construction operations.

4.21 IMPACT COMPARISON AND CONCLUSIONS

The environmental effects of the alternatives were evaluated and compared with the No Action Alternative. Many of the environmental effects were similar for each of the Action Alternatives, which are evaluated in detail in Chapter 4 and summarized in Section 4.21 (**Table 4-16**). However, changes to the affected environment are seen in land use, soils/total phosphorus removal, surface water, water quality, and wetland impacts as a result of the Alternatives. In this evaluation, a cost benefit analysis was recognized between the alternatives and is an aid in evaluating the environmental consequences. The differences in the affected environmental factors, including the cost benefit analysis, are summarized below.

LAND USE

Alternatives 2, 3, and 4 would require the A-1 project site to be used primarily for water quality purposes. Because the lands are required to be used to conduct restoration activities in the Everglades ecosystem pursuant to the Farm Bill and the Cooperating Agreement, each of the action alternatives would require approval for an interim land use change from USFWS/DOI.

SOILS/TP CONCENTRATIONS

Lower phosphorus concentrations discharged from the STA 2 and STA 3/4 would reduce the rate of soil phosphorus accumulation in WCA soils. Over time, reductions in soil total phosphorus will help facilitate the restoration of impacted areas near the inflow points to WCA 2A and WCA 3A creating conditions more conducive to historic Everglades vegetative communities. The FEBs proposed in Alternatives 2 and 3 have the potential to benefit soils within STA 2 and STA 3/4 by maintaining minimum water levels and reducing the frequency of dryout conditions. The probability of experiencing dryout conditions in STA 2 and STA 3/4 is greatest under Alternative 4 (STA). In general, as additional STA acreage is added (as in Alternative 4), the potential risk of STA dryout, and associated impacts to phosphorus removal performance within existing and new STAs, increases, whereas, when additional storage is added (as in Alternative 2 and 3), the potential for dryout within existing STAs decreases.

HYDROPERIOD ANALYSIS

Alternative 2 has the least change in hydroperiod in WCA 2A, while Alternative 3 has the least change in hydroperiod in WCA 3A. Alternative 4 has no change in the hydroperiod in either WCA. The hydroperiod changes that are simulated to occur are for all the Action Alternatives are limited to a small percentage of area within WCA-2A (0.6 – 3.1%) and WCA-3A (0.2 – 2.2%). The minor differences in WCA-2A hydroperiods for Alternatives 2 and 3 occur mainly due to a shift in the location of WCA-2A inflows from S-7 to the L-6 Canal, however the total inflow volumes to WCA-2A are approximately equivalent. The hydroperiod changes that occur in WCA-3A are most likely due to the different structural and operational characteristics related to the facilities (Shallow FEB, Deep FEB, STA) evaluated within the project site.

WATER QUALITY

The purpose of the project is to assist STA 2 and STA 3/4 in meeting the WQBEL at discharges from the STAs into the Everglades Protection Area. The No Action Alternative does not meet the project purpose since STA 3/4 would not meet the WQBEL at the STA outflow. Alternatives 2, 3, and 4 are projected to meet the WQBEL at outflows from both STAs.

The WQBEL requires that STA discharges shall not exceed: 1) 13 ppb as an annual flow-weighted mean in more than three out of five water years on a rolling basis; and 2) 19 ppb as an annual flow-weighted mean in any water year.

Table 4-18 Summary of Water Quality Analysis

Alternatives	STA 2 Outflows (ppb)	STA 3/4 Outflows (ppb)	WCA 2A Inflows (ppb)	WCA 3A Inflows (ppb)
Alternative 1: No Action	13	18	16	17
Alternative 2: Shallow FEB	13	13	13	12
Alternative 3: Deep FEB	12	13	12	12
Alternative 4: STA	12	12	12	12

WETLANDS

Natural wetlands will be permanently altered within the boundaries of the project site as unavoidable adverse wetland and surface water impacts would occur due to placement of fill and excavation. Jurisdictional wetland impacts for levee fill vary between each alternative since each project would require specific width, heights, and location of levees. Jurisdictional wetland impacts for levee fill are greatest with Alternative 3 because the taller levees require a wider base. Jurisdictional wetland impacts for Alternative 4 require external and internal levees. Alternative 4 also requires excavation and fill in Holey Lands to construct a canal and with berms/levees. The Shallow FEB has the lowest wetland impacts of the Action Alternatives.

Jurisdictional wetland impacts are least for the No Action Alternative. Below is a table summarizing the wetland impacts for each alternative.

Table 4-19 Summary of Wetland Impacts (acres)

Impact Type/Area	Proposed Levee Fill	Proposed Canal Fill	Proposed Canal Excavation	Holey Land Wildlife Management Area		Total
Alternative 1: No Action	0	0	0	0		0
Alternative 2: Shallow FEB	280.1	112.8	43.0	0		435.9
Alternative 3: Deep FEB	533.6	0	43.0	0		576.6
Alternative 4: STA	353.6	112.8	270	250		986.4

COST

Each of the alternatives would require approval for a land use change. The No Action Alternative does not meet the project purpose since STA 3/4 would not meet the WQBEL at the STA outflow. However, Alternatives 2, 3, and 4 would meet the WQBEL for STAs 2 and 3/4. Although meeting the WQBEL, the probability of experiencing dryout conditions in STA 2 and STA 3/4 is greatest under Alternative 4 (STA) while Alternatives 2 and 3 offer the greatest benefit to reducing dryout conditions. Alternative 2 would result in the least amount of wetland impacts. In weighing the merits and drawbacks of the various alternatives, a cost benefit analysis was also considered in this evaluation since the project is funded with tax-payer dollars and the impacts to the public could assist in determining an important qualitative consideration.

Of the Alternatives that are projected to meet the WQBEL at the outflow from both STA 2 and STA 3/4, Alternative 2 is the least expensive. Alternative 3 required additional excavation for the Deep FEB for an inflow pump station and fill material for larger levees, as well as the seepage cutoff wall and additional protection features needed for flood protection. This alternative would utilize more excavated rock that is already on site. Alternative 4 (STA) would require additional levees to separate the EAV and SAV cells, as well as a new discharge canal within Holey Land.

Table 4-20 Summary of Cost

Alternative	Sunk Cost	Estimated Construction Costs	Total Cost
1 - No Action	$180,000,000	$0	$180,000,000
2 - Shallow FEB	$180,000,000	$60,000,000	$240,000,000
3 - Deep FEB	$180,000,000	$593,000,000	$773,000,000
4 - STA	$180,000,000	$288,000,000	$468,000,000

The current and reasonably foreseeable actions' direct and indirect effects on most of these resource categories were predicted to have no effect or to have a minor degree of effect, or at most a moderate degree of effect. The only major degree of effect was associated with listed species. None of these effects were significant. Most were relatively limited in extent, with the categories' effects confined within the boundaries of the action. The primary exception to this was environmental justice, and for that resource category the current and reasonably foreseeable actions were expected to have a minor, beneficial, and non-disproportionate effect. Finally, although all of these resource categories generated interest during scoping and comments on the Draft AEIS, this factor alone was not sufficient to elevate any of the categories to the level of the significant cumulative impact issues.

CHAPTER 5
COMPENSATORY MITIGATION

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5.0 MITIGATION

As defined by the Council on Environmental Quality, Title 40 Code of Federal Regulation (CFR) §1508.20, mitigation requirements include the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impacts over time by preservation and maintenance operations during the life of the action; and
- Compensating for the impacts by replacing or providing substitute resources or environments.

Under the Clean Water Act (CWA) Section 404(b)(1) guidelines implemented through 40 CFR Part 230, the South Florida Water Management District (SFWMD) shall be required to avoid and minimize impacts to waters of the United States (US), then provide compensatory mitigation for unavoidable adverse impacts. Mitigation measures for the Action Alternatives were identified as best management practices (BMPs) and compensatory mitigation, which are discussed in the following sections.

5.1 ENVIRONMENTAL COMMITMENTS

5.1.1 BEST MANAGEMENT PRACTICES

During construction activities for all Action Alternatives, the SFWMD would implement standard construction BMPs to avoid affecting the surrounding environments. Standard construction BMPs include, but are not limited to:

1. Installing siltation fences to prevent erosion and to provide turbidity barriers to minimize suspended solids in the water column;
2. Downstream turbidity shall be monitored to ensure state turbidity standards (29 nephelometric turbidity units) are not exceeded;
3. Watering construction sites and roads to reduce dust generation;
4. Suspending surface-disturbing activities such as grading during periods of particularly high winds;
5. Maintaining construction equipment according to the manufacturer’s specifications;
6. Transporting demolition debris to a landfill or otherwise disposed of in accordance with federal, state, and local requirements;

7. Prior to construction, dewatering permits shall be issued by the Florida Department of Environmental Protection (FDEP) under Chapter 373 F.S. The permit would include requirements for the construction contractor to submit a Stormwater Pollution Prevention Plan, which includes turbidity control and monitoring plans; and
8. Although not anticipated for any of the Action Alternatives, if relocation of utility lines is needed, the SFWMD shall coordinate formally with Florida Power and Light once the design process is complete.

5.1.2 THREATENED OR ENDANGERED SPECIES AND SPECIES OF CONCERN

Although specific details will be developed as consultation occurs between the US Amy Corps of Engineers (USACE) and the US Fish and Wildlife Service (USFWS), it is anticipated that at a minimum, the following measures shall be incorporated during project construction to minimize effects on any threatened or endangered species that may occur in the construction site: a) Standard Protection Measures for the Eastern Indigo Snake (2004); b) Habitat Guidelines for the Wood Stork in the Southeast Region (2009); and c) Everglades Snail Kite Management Guidelines (2009).

5.1.3 HAZARDOUS AND TOXIC WASTE

Under the No Action Alternative, the land may be leased or sold for agricultural use. If agricultural activities would commence on the project site, there is the potential for release of petroleum or agricultural chemicals, which would be subject to regulation under the Florida Department of Environmental Protection. During previous construction activities for the A-1 Reservoir, the SFWMD partially remediated a tract of land north of the project site, referred to as the Woerner Tract, by excavating contaminated soils with elevated levels of toxaphene. Portions of the Woerner Track still contain elevated levels of toxaphene. However, under all of the Action Alternatives, those areas of known soil contamination have been excluded from the project footprint so no mitigative measures are required.

For Alternatives 2, 3, and 4, there would be no dumping of oil, fuel, or hazardous wastes in the work area and safe and sanitary measures for disposal of solid wastes would be required. A spill prevention plan shall also be required.

5.2 WETLAND IMPACTS

In accordance with the CWA Section 404(b)(1) Guidelines 40 CFR Part 230, wetland and aquatic resource impacts are first avoided, then minimized to the maximum extent practicable. Section 404 of the CWA requires compensatory mitigation to replace aquatic resource functions unavoidably lost or adversely affected by authorized activities.

Mitigation must meet the requirements of the 2008 Mitigation Rule, 40 CFR Part 230 and 33 CFR Parts 325 and 332. The following sections discuss the project's impacts to wetlands and the compensatory mitigation proposed.

5.2.1 SITE CONDITIONS

The A-1 project site contains 16,517.9 acres of land of which 14,656.9 acres are wetlands and 1,861.0 acres are uplands. Alternatives 2, 3, and 4 will involve the placement of fill material within wetlands to construct levees, berms, pump stations. The alternatives also propose to excavate soils to remove stockpiled material and fill interior ditches and canals to achieve designed elevations. The impacts to waters of the US for each alternative are described below. The calculations of the impacts were revised since the draft EIS as the project designs were further refined.

5.2.2 DIRECT IMPACTS

The wetland impacts for each alternative are summarized on **Table 5.1**:

Table 5-1 Wetland Impacts for each alternative

Impact Type/Area	Proposed Levee Fill (in acres)	Proposed Canal Fill (in acres)	Proposed Canal Excavation (in acres)	Holey Land Wildlife Management Area (in acres)	Total (in acres)
Alternative 1: No Action	0	0	0	0	0
Alternative 2: Shallow FEB	280.1	112.8	43.0	0	435.9
Alternative 3: Deep FEB	533.6	0	43.0	0	576.6
Alternative 4: STA	353.6	112.8	270	250	986.4

5.2.2.1 Alternative 1 (No Action)

Under the No Action Alternative, the site could either remain undisturbed or the SFWMD could lease or possibly sell the property to allow agricultural activities to resume. If the site were to remain undisturbed, there would be no impacts to wetlands or waters of the US; therefore, there would be no compensatory mitigation requirements. If the agricultural activities would resume on the project site, the wetlands would be cleared of vegetation, and pumping would drain the water off of the lands. Although the work associated with the agricultural activites would result in an overall loss of wetlands, the agricultural activities are exempt under Section 404 of the Clean Water Act.

5.2.2.2 Alternative 2 (Shallow FEB)

The direct impacts associated with Alternative 2 (Shallow FEB) result in 435.9 acres of wetlands and waters of the US as a result of levee and canal fill, as well as canal excavation. Of the 435.9 acres of impacts, 280.1 acres of wetlands would be filled to construct the levee and backslope muck piles, 112.8 acres of canals and ditches would be filled to raise the elevation of the ditch/canal to be consistent with the adjacent wetlands, and 43.0 acres of freshwater marsh wetlands would be excavated to construct a canal. The impacts to 112.8 acres of canals and ditches would be an improvement to the wetland habitat as the fill would be placed in the canal/ditch to raise the canal bottom up to surrounding wetland elevation. The SFWMD has revised the designs in response to comments received from the Florida Fish and Wildlife Commission and incorporated areas within the interior FEB to have sloped levees with a wider base. Although the internal levee slope design increases wetland impacts by additional 101.8 acres of fresheater marsh, the sloped levee would create transitional littoral zones and allow wildlife species the ability to vacate the area easier as waters rise. The existing muck piles would be backsloped along the interior levee in two areas to create a maximum of 30:1 (H:V) slope.

5.2.2.3 Alternative 3 (Deep FEB)

The direct impacts associated with Alternative 3 (Deep FEB) result in 576.6 acres of wetlands and waters of the US as a result of levee fill as well as canal excavation. Of the 576.6 acres of impacts, 533.6 acres of wetlands would be filled to construct the levee and 43.0 acres of canal would be excavated. In addition, 10,820 acres of the deep FEB footprint will be flooded more frequently compared to the Shallow FEB or the STA resulting in adverse impacts to wetlands. Alternative 3 would not require fill in canals or ditches.

5.2.2.4 Alternative 4 (STA)

The direct impacts associated with Alternative 4 (STA) result in 986.4 acres wetlands and waters of the US as a result of levee and canal fill, canal excavation, and excavation/fill of freshwater wetlands. Of the 986.4 acres of impacts, 353.6 acres of wetlands would be filled to construct the levee, 112.8 acres of canals and ditches would be filled, 270 acres of canals would be excavated, and 250 acres of freshwater wetlands would be impacted (125 acres of excavation to dig the canal and 125 acres of fill to build the levee adjacent to the canal) to construct a canal connection within the Holey Land Wildlife Management Area.

5.3 COMPENSATORY WETLAND MITIGATION

The SFWMD provided a compensatory wetland mitigation plan for their preferred alternative, the Shallow FEB, which includes hydrologic and vegetation benefits within the footprint of the project (Appendix C). Although each alternative would vary in degree of on-site ecological benefits, it is anticipated that the hydrology and the vegetation community within the footprint of the project would change by retaining additional water on the site.

The SFWMD is proposing to receive credit for providing and retaining the hydrology within the project footprint and improving the aquatic habitat. Although the attenuation of water within the footprint is expected to decrease soil loss due to oxidation and reduce water column total phosphorous from the No Action Alternative, the various depth of water and differing operation plans would result in different site conditions between the Alternatives. Each Alternative would contain different wetland communities, each supporting different wetland dependent birds, mammals, reptiles, amphibians, and animal species. Therefore, each Action Alternative would have different aquatic function and values.

Under Alternatives 2, 3, and 4, the SFWMD would remove exotic vegetation as maintenance once the proposed project is constructed. Routine maintenance of the levees, as well as any wetland areas within the project footprint would also be performed. Reporting maintenance activities, as well as monitoring the vegetation is included in the South Florida Environmental Report (SFER), which is produced annually and provided to the USACE and all interested parties.

Hydrologic monitoring and water quality monitoring shall also be conducted as part of normal operations. The monitoring shall be consistent with permit compliance for the constructed project and for operational improvements. This information is also reported on an annual basis in the SFER.

5.3.1 Alternative 1 (No Action)

In the event agricultural activities would resume, the area would be drained and there would be a loss of hydrology on the project site. The natural wetland vegetation would be removed and the site would be planted with agricultural vegetation, possibly sugar cane or sod. Therefore, no compensatory mitigation is needed for the No Action Alternative.

5.3.2 Alternative 2 (Shallow FEB)

Under Alternative 2, the four wetland communities would be converted from the existing condition, as described in Section 3.7.1, to a freshwater marsh consisting primarily of cattail

(*Typha domingensis*). Other native species expected within the shallow FEB may consist of emergent aquatic vegetation (EAV) such as sawgrass (*Cladium jamaicense*), Carolina willow (*Salix caroliniana*), bulrush (*Scirpus* spp), pickerel weed (*Pontederia cordata*), duck potato (*Sagittaria lancifolia*), and Illinois pondweed (*Potamogeton illinoensis*).

The Shallow FEB would contain water depths ranging from 0 to 4 feet, and is expected to be inundated with approximately 1.5 feet or more of water for 60% of the time. The monthly water depths average between 1 and 3.5 feet. The Shallow FEB would be operated in a manner to ensure STA 2 and STA 3/4 contains appropriate water levels. The Shallow FEB would be operated to take up to 4 feet of water and continue to store the excess water even if the water levels remain high for a period of time. During this period of time of high water events, the freshwater marsh wetland community within the Shallow FEB is expected to be inundated with water that negatively affects the vegetation. Conversely, as water will be pumped from the Shallow FEB to supply water STA 2 and STA 3/4, the Shallow FEB will most likely dry earlier than the existing STAs and may not contain standing water during the dry periods. During this time, it is anticipated that the freshwater marsh wetland community within the Shallow FEB would be negatively affected by the drought. Therefore, the ecological benefit or “lift” of both hydrology and vegetation will be affected by the changes and may not be as beneficial as a typical restoration project.

5.3.3 Alternative 3 (Deep FEB)

For the deep FEB, the four wetland communities would be converted from the existing condition, as described in the No Action Alternative, to a vegetation community consisting mainly of freshwater floating aquatic vegetation (FAV) species, similar to those found in the canals and ditches.

Alternative 3 would contain water depths ranging from 0 to 12.5 feet, and is expected to be inundated with approximately 1.5 feet or more of water for 60% of the time. The monthly water depths average between 2 and 5 feet. Due to the greater depth capacity, this Alternative may hold additional water during excess rain events. Similar to the Shallow FEB, the Deep FEB will also be operated in a manner that ensures the STAs 2 and 3/4 receive preferential quantities of water to ensure more consistent water levels in the STAs. The Deep FEB would be operated to take up to 12 feet of water and continue to store the excess water even if the water levels remain high for a period of time. During this period of time of high water events, the freshwater marsh wetland community within the Deep FEB is expected to be inundated with water that negatively affects the vegetation. Conversely, as water will be pumped from the Deep FEB to supply water STA 2 and STA 3/4, the Deep FEB will most likely dry earlier than the existing STAs and may not contain standing water during the dry periods. During this time, it is anticipated that the freshwater marsh wetland community within the Deep FEB would be negatively affected by the drought. Similar to the Shallow FEB, the anticipated lift may not be as beneficial as a typical restoration project.

5.3.4 Alternative 4 (STA)

The STA would have a maximum operating depth of 4 feet. For the STA alternative, the four wetland communities would be converted from the existing condition, as described inSection 3.7.1, to two types of wetland communities: EAV and submerged aquatic vegetation (SAV). The STA would be designed to route water through specified EAV cells or SAV cells, each with a specific operating depth to support the wetland community. EAV cells would be operated at target depths between 1.25 and 1.5 feet of water, while the SAV cells would be operated at target depths between 1.5 and 2.0 feet of water during normal operations. The vegetation community expected in the EAV cells consist of sawgrass (*Cladium jamaicense*), Carolina willow (*Salix caroliniana*), bulrush (*Scirpus* spp), pickerel weed (*Pontederia cordata*), duck potato (*Sagittaria lancifolia*), and Illinois pondweed (*Potamogeton illinoensis*), while the vegetation found in the SAV cells would include native plant species similar to the EAV but may also contain coontail (*Ceratophyllum demersum*), muskgrass (*Chara* spp.), pondweeds [*Potamogeton* spp. (esp. *P. illinoensis*, *P. pusillus*)], and Southern naiad (*Najas quadalupensis*).

Alternative 4 would contain water depths ranging from 0 to 4 feet, and is expected to be inundated with approximately 1.5 feet or more of water for 60% of the time. The proposed STA would contain average monthly water depths between 1.5 and 2.5 feet. The STA would be operated as an additional STA and would not be utilized to store excess water or provide water preferentially to STA 2 or STA 3/4 to ensure more consistent water levels in those STAs. As seen in the existing STAs, the emergent and submerged cells are heavily utilized by a variety of wildlife species including wading birds, ducks, hawks, fish, amphibians, and alligators.

5.4 UMAM ASSESSMENT

The USACE utilizes Uniform Mitigation Assessment Methodology (UMAM) to determine the function and value of the wetlands. The SFWMD has performed a preliminary UMAM assessment and submitted their UMAM proposal for the pre- and post-project conditions for review. The UMAM specifically assessed the construction and operation of the SFWMD's preferred alternative, the shallow FEB. If another alternative is selected as the least environmentally damaging practical alternative, the SFWMD will provide a separate UMAM assessment for the other alternative. However, the USACE is providing an estimated UMAM score for the other alternatives (Deep FEB and STA) for purposes of this Environmental Impacts Statement (EIS).

5.4.1 ALTERNATIVE 2 (SHALLOW FEB)

The impacts from the Shallow FEB project would result in a loss of 280.1 acres of wetlands as a result of fill to construct the levees, 43.0 acres of wetland impact for canal excavation, and 112.8 acres of fill in canals. The post project site conditions within the Shallow FEB would improve the aquatic function and value from the existing site conditions. By providing hydrology to the wetlands and improving elevations, the low quality wetlands on the site would be improved. Wetland impacts resulting from construction of the Shallow FEB would result in the loss of 205.1 functional capacity units while the improvements to the wetlands within the interior of the shallow FEB is expected to result in a gain of 1,729.4 functional capacity units (FCUs). Overall, the project may result in a net gain of 1,524.3 functional capacity units. See **Table 5-2** and **Table 5-3** below for a breakdown of the impacts and the credits.

As a result of comment on the draft EIS, the cooperating agencies reviewed the UMAM scores for the Shallow FEB and commented on the water environment and the risk, and the scores have been revised accordingly. The UMAM sheets are included in this Final EIS as Attachment 2 (UMAM Mitigation Sheets).

The wetlands within the Shallow FEB meet USEPA's *Guiding Principles for Constructed Treatment Wetlands*, which states "in general, wetlands constructed or restored for the primary purpose of treating wastewater will not be recognized as compensatory mitigation to offset wetland losses" (Appendix C) because the purpose of the wetlands is not for water quality treatment, but storage of water which would be provided to the STAs that actually treat the water. Although it is recognized that the wetlands within the Shallow FEB would offer some ancillary treatment benefits, their purpose is water storage. The USACE does not have any remaining concerns with the mitigation plan for the Shallow FEB. The USACE agrees that the Shallow FEB would provide wetland benefits and the loss of wetland function and value is offset.

Table 5-2 Alternative 2 (Shallow FEB) UMAM Assessment for Impacts

Habitat	acreage	Pre-UMAM	Post-UMAM	Delta	Time lag	Risk	FCU
Freshwater marsh fill	280.1	0.53	0	-0.53			-148.5
Fill in canals and	112.8	0.30	0	-0.30			-33.8

ditches							
Freshwater marsh excavation	43.0	0.53	0	-0.53			-22.8
Total							-205.1

Table 5-3 Alternative 2 (Shallow FEB) UMAM Assessment for Mitigation

Habitat	acreage	Pre-UMAM	Post-UMAM	Delta	Time lag	Risk	FCU
Scrub/Shrub wetlands (Exotic Degraded Wetlands)	10,504.3	0.33	0.53	0.20	3 yr/ 1.07	1.50	1,313.0
Exotic Scrub/Shrub wetlands (Exotic Dominated Wetlands)	203.2	0.23	0.53	0.30	3 yr/ 1.07	1.50	38.0
Canals and Ditches	112.8	0	0.53	0.53	3 yr/ 1.07	1.75	32.2
Uplands to emergent marsh	1,214.7	0	0.53	0.53	3 yr/ 1.07	1.75	346.2
Total							1,729.4

Ledger System:

The UMAM assessment for Alternative 2 (Shallow FEB) results in a surplus of credits. The surplus of credits demonstrates that the project results in an overall benefit to the environment as compared to the existing site conditions. The SFWMD has requested to utilize the remaining credits to offset any unavoidable wetland impacts for future SFWMD's Restoration Strategies projects. The remaining credits would be tracked under a ledger system. The identified Functional Capacity Units surplus is approximately 1,524.3 credits for the Shallow FEB (**Table 5-6**). If another alternative were selected, the SFWMD would also propose to utilize any excess credits for future SFWMD Restoration Strategy projects. For this discussion, the Shallow FEB alternative is discussed.

Table 5-4 Alternative 2 (Shallow FEB) Ledger

Project	Total Functional Capacity Units
A-1 Shallow FEB Total Credits	1,729.4
A-1 Shallow FEB	-205.1
Total Credits	1,524.3

The Shallow FEB Alternative would provide significantly more mitigation credit than is needed to offset the impacts from construction. The USACE has evaluated whether it is appropriate to utilize the excess functional capacity units from the Shallow FEB Alternative as compensatory mitigation to offset wetland impacts for future projects. The Shallow FEB will be operated as a water storage site to enhance the operation of the STAs. The shallow FEB will accept water during storm events, and supply water to the existing STAs during the dry season. The USACE recognizes that the Shallow FEB would be susceptible to more drastic changes in water elevations and will sacrificially experience dry-out conditions in favor of STA 2 and STA 3/4. These changes in hydrology will cause the wetland community to change between marsh wetlands and wet prairie wetlands, with dryer dry periods. The USACE recognizes that this is a great benefit for water quality purposes within the EPA and an improvement to the current site conditions on the project site. However, the effects from changes in hydrology on the wetlands at the project site may not make appropriate mitigation to offset future impacts for other projects, especially if there is dissimilar vegetation or hydroperiod as this would be out of kind. This option would be evaluated on a case by case basis for each future project.

5.4.2 ALTERNATIVE 3 (DEEP FEB)

The construction of the Deep FEB would result in impacts to 576.6 acres of waters of the US, including 533.6 acres of wetland impacts as a result of fill in freshwater wetlands and 43.0 acres of wetland impacts as a result of canal excavation, as well as the permanent impact to the interior wetlands from water depths that no longer function as wetlands. The construction of the Deep FEB alone would require 318.5 FCUs to be offset (**Table 5-4**). The Deep FEB would offer little wetland benefits on the project site because the reservoir would have depths greater than 4 feet of water 30% of the time, which would flood any rooted vegetation and greatly reduce wetland function and value. Additionally, the Deep FEB is anticipated to exhibit longer durations of water at deeper water depths, which is expected to encourage floating aquatic vegetation to establish. The site may not exhibit characteristics of a wetland but rather an open water pond or lake. Rooted wetland vegetation that may establish within the Deep FEB during low water levels would die off, resulting in difficulty in reestablishment between the flood/dry cycles. The poor habitat provided within the reservoir would not be an appropriate mitigation to offset the wetland impacts of the project. The USACE would require that the applicant provide an alternative compensatory mitigation plan, possibly purchasing credits at a federally approved mitigation bank or mitigation at another appropriate offsite location.

Table 5-5 Alternative 3 (Deep FEB) UMAM Impacts Assessment*****

Habitat	acreage	Pre-UMAM	Post-UMAM	Delta	Time lag	Risk	FCU
Freshwater marsh fill	576.6	0.53	0	-0.53			-305.6
Excavation for canal	43.0	0.30	0	-0.30			-12.9
Total							-318.5

***the degradation of the internal wetlands from flood/dry cycles is not captured by this table**

5.4.3 ALTERNATIVE 4 (STA)

The impacts from the STA Alternative would result in a loss of 353.6 acres of wetlands as a result of fill to construct the levees, 270.0 acres of wetland impact for canal excavation, 112.8 acres of fill in canals, and 250 acres of excavation and fill of wetlands within the Holey Land. The impacts resulting from construction of the STA will result in a loss of 477.2 functional capacity units. See **Table 5-5** below for a breakdown of the impacts. The SFWMD has not provided a separate compensatory mitigation plan for Alternative 4. The post-project site conditions within the A-1 STA would improve the aquatic function and value from the existing site conditions. However, the STA, once operated, would no longer be considered a water of the US as it would be operated under a NPDES permit. Also, the use of constructed treatment wetlands as compensatory mitigation conflicts with USEPA's *Guiding Principles for Constructed Treatment Wetlands*, which states "in general, wetlands constructed or restored for the primary purpose of treating wastewater will not be recognized as compensatory mitigation to offset wetland losses" (Appendix C). As such, STAs are not typically utilized as compensatory mitigation. However, some exceptions have been permitted by the USACE in cases where the STA itself is for environmental restoration purposes and the losses are offset only for atypical wetlands. In this instance, the exception would not apply since the atypical wetlands have reverted back to a more natural wetland type and agricultural vegetation does not exist in the wetlands. If the SFWMD were to propose environmental benefits within the interior of the STA as their compensatory mitigation plan, further coordination with the USEPA would be required.

Table 5-6 Alternative 4 (STA) UMAM Assessment for Impacts

Habitat	acreage	Pre-UMAM	Post-UMAM	Delta	FCU
Freshwater marsh fill for levee	353.6	0.53	0	-0.53	-187.4
Fill in canals	112.8	0.30	0	-0.30	-33.8
Excavation in canals and ditches	270	0.30	0	-0.30	-81.0
Excavation/Fill in Holey Land	250	0.70	0	-0.70	-175.0
Total					-477.2

CHAPTER 6
COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

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6.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

Coordination with and evaluation of required compliance with specific federal acts, executive orders, and other policies for the various alternatives was achieved, in part, by coordinating this document with appropriate agencies and the public. This section documents compliance with all applicable federal statutes, executive orders, and policies.

6.1 CLEAN AIR ACT OF 1970, AS AMENDED

The initial Clean Air Act was enacted in 1970 and was dramatically revised and expanded in 1990, giving the U.S. Environmental Protection Agency (USEPA) broader authority to implement and enforce regulations that reduce acid rain, urban air pollution, and toxic air emissions. As described in Chapter 8, air quality permits may be required for pump stations. The South Florida Water Management District (SFWMD) will apply for these permits, which the Florida Department of Environmental Protection (FDEP) and the USEPA will review, if necessary. The Proposed Action complies with this statute.

6.2 CLEAN WATER ACT OF 1972, AS AMENDED

The Federal Water Pollution Control Act Amendments of 1972 became commonly known as the Clean Water Act (CWA) with its amendment in 1977. The act established the basic structure for regulating discharges of pollutants into the waters of the United States. The Proposed Action would assist existing stormwater treatment areas (STAs) in making progress towards achieving water quality goals for total phosphorus in the Everglades Protection Area (EPA). As described in Chapter 8, the construction of the shallow FEB, deep FEB or Reservoir, or STA alternatives would require a CWA, Section 404 Dredge and Fill Permit issued by U.S. Army Corps of Engineers (USACE). The applicability of Section 404 triggers Section 401 Water Quality Certification of the CWA. A Section 404 permit application has been submitted to USACE.

In addition, the STAs also require, and have been issued a Section 402, National Pollution Discharge Elimination System permit by Florida DEP. This permit requires compliance with applicable state water quality standards.

The Proposed Action complies with the CWA of 1972, as amended.

6.3 COASTAL ZONE MANAGEMENT ACT OF 1972

The Coastal Zone Management Act of 1972, as amended, provides the national policy to preserve, protect, develop, and restore the nation’s coastal zones and was established to encourage states to better manage their coastal resource. The statute assists coastal states in developing state coastal management programs and achieving a balance between competing uses of coastal resources. The statute requires that federal actions that may affect any land or water use of the coastal zone be “consistent” with the enforceable policies of a coastal state’s or territory’s federally approved coastal management program. The Proposed Action is consistent with the Florida Coastal Management Program. No comments on the Notice of Intent (NOI) for this environmental impact statement (EIS) have been submitted by the Florida State Clearinghouse.

6.4 ENDANGERED SPECIES ACT OF 1973

The Endangered Species Act of 1973 replaced the Endangered Species Conservation Act of 1969 and provides protections for species that are threatened or endangered throughout all or a significant portion of their geographic range and the habitats that those species use. In the ESA, “endangered” species are defined as in danger of extinction throughout all or a significant portion of its range, “threatened” species are likely to become endangered within the foreseeable future throughout all or a significant portion of its range, and “species of special concern” might need concentrated conservation actions. The EIS assesses effects to all federal and state listed species that are expected to occur in the project-affected area, described in Chapter 3. Coordination for threatened and endangered species was initiated with USFWS on December 10, 2012. Per agreement between USACE and USFWS, the biological assessment (BA) for the project site will determine the effects to listed species by comparing the baseline condition defined as the projects that have been previously consulted with the USFWS to the changes resulting from the construction and operation of the applicant’s preferred alternative. A biological opinion will be obtained from USFWS before USACE issues the record of decision (ROD) and makes a permit decision on the Section 404 permit application. The USACE’ decision will comply with the ESA.

6.5 ESTUARY PROTECTION ACT OF 1968

The Estuary Protection Act emphasizes the values of estuaries and the need to conserve these natural resources. The Act authorized an inventory and studies of U.S. estuaries to determine whether these areas should be acquired by the federal government for protection, and authorized cost-sharing between the federal and state governments for management of estuary resources.

Water management in Lake Okeechobee periodically involves releasing large quantities of water into these estuaries, resulting in changes in salinity and in dissolved oxygen content, increased turbidity, and nutrification within the estuaries. None of the action alternatives would change freshwater releases from Lake Okeechobee to the Northern Estuaries, which include the St. Lucie and Caloosahatchee Estuaries and the Indian River Lagoon. Therefore, all of the action alternatives would not change the frequency, duration, or timing of lake releases. The alternatives discussed within this document would not adversely affect estuaries nor increase the frequency and/or duration of releases to the estuaries. The project complies with this statute.

6.6 EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

Executive Order 11990 requires federal agencies to avoid, to the extent possible, the adverse impacts associated with destruction or modification of wetlands. The action complies with the goals of this executive order.

6.7 EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT

Executive Order 11988 requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with occupancy and modification of floodplains. It further directs federal agencies to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The project is in the base floodplain (100-year flood) and has been evaluated in accordance with this executive order. The action is in compliance.

6.8 EXECUTIVE ORDER 12866, REGULATORY PLANNING AND REVIEW

Executive Order 12866 aims to improve the process of planning and reviewing of regulations and to make it more efficient. Its objective is to re-establish the federal government's primary position in the regulatory decision-making process and to make the process more accessible to the public. This Executive Order is intended only to improve the internal management of the Federal Government. The action is in compliance.

6.9 EXECUTIVE ORDER 12875, ENHANCING THE INTERGOVERNMENTAL PARTNERSHIP

The purpose of Executive Order 12875 is to enhance intergovernmental consultation and collaboration on federal matters and to prevent the federal government from imposing unfunded regulations on state, local, and tribal governments. It prohibits federal agencies from putting into effect any regulations that are not required by statute unless the affected state, local, and tribal governments are provided funds by the federal government. However, this executive order only applies to those regulations which the federal government has the power to waiver. It requires federal agencies to provide the Director of the Office of Management and Budget a representation of all consultations and collaborations that occur between the agency and the affected governments. This executive order also requires that the federal agency allow time for state, local, and tribal governments to participate in the development of such regulations. The agency shall take into account any application provided by the affected government to waiver regulatory requirements in order to provide flexibility to the affected government as long as these are in compliance with the federal policy objectives. The action is in compliance.

6.10 EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE

Executive Order 12898 requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Executive Order 12898 requires the Federal government to review the effects of their programs and actions on minorities and low income communities. As described in Chapter 4, the effects of the Proposed Action would not be disproportionate toward any minority or low-income populations. The action complies with the goals of this Executive Order.

6.11 EXECUTIVE ORDER 13112, INVASIVE SPECIES

Executive Order 13112 requires federal agencies to, among other tasks, prevent the introduction of invasive species, monitor invasive species populations, restore native species and habitat where invasions have occurred, and promote public education. The proposed Action Alternatives would reduce total phosphorus loading, which should reduce the proliferation of invasive cattails in the EPA. This action complies with this executive order.

6.12 FARMLAND PROTECTION POLICY ACT OF 1981

The purpose of the Farmland Protection Policy Act (FPPA) is to “minimize the extent to which Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses...” The act specifically targets the urban sprawl resulting from the conversion, and the associated wastes of resources and energy. This project has been coordinated with the Natural Resources Conservation Service (NRCS) and complies with this statute.

6.13 FISH AND WILDLIFE COORDINATION ACT OF 1958

The Fish and Wildlife Coordination Act (FWCA) requires that fish and wildlife receive equal consideration as other project components for proposed water resource development projects and that appropriate mitigation for impacts be provided. This statute is implemented through consultation with the USFWS.

As described in Chapter 7, the Department of Interior (DOI) and the USFWMD are cooperating agencies in developing this EIS. An ongoing consultation process between the USACE and the USFWS has involved regular communication and exchange of input between the agencies through monthly interagency coordination meetings, public scoping meetings, and correspondence. A final record of the USFWS determination is included in the Final EIS in Appendix L.

6.14 MAGNUSON-STEVENS FISHERY CONSERVATION ACT

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) mandated NMFS and the Fisheries Management Council include the identification and protection of essential fish habitat (EFH) in all federal fishery management plans. NMFS implements and enforces the MSFCMA through consultation with federal agencies required for any federally funded, permitted, or proposed work that may affect EFH. As documented in Chapter 3, no EFH exists within the footprint of the project or within an extended distance of the proposed project. As a result, consultation with NMFS was not initiated. The Proposed Action complies with this statute.

6.15 MARINE MAMMAL PROTECTION ACT OF 1972, AS AMENDED

The Marine Mammal Protection Act prohibits the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, and also prohibits importation of marine mammals and marine mammal products into the United States. The only marine mammal known to enter waterways within the EAA is the West Indian manatee. The Comprehensive Everglades Restoration Plan (CERP) Interagency Manatee Task Force showed that manatees navigated through the Okeechobee Waterway and accessed the EAA canals through the gates at the S- 351, S-352 and S-354 structures (CERP Interagency Manatee Task Force, 2006). (The task force is made up of representatives from USFWS, FWC, USACE, USGS, the National Park Service, the Miami-Dade Department of Environmental Resources Management, and private researchers.) Subsequently, manatee barriers have been installed at these control structures;

therefore, manatees are not expected within canals adjacent to the project. The Proposed Action complies with the Marine Mammal Protection Act.

6.16 MIGRATORY BIRD TREATY ACT OF 1918, AS AMENDED, AND THE MIGRATORY BIRD CONSERVATION ACT

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, prohibits pursuing, hunting, taking, capturing, killing, or selling migratory birds, as identified in the Act, through international conventions between the United States and Great Britain, Mexico, Japan, Canada, and Russia. The Migratory Bird Conservation Act establishes a Migratory Bird Conservation Commission that makes decisions acquiring lands or waterbodies identified by the Secretary of the Interior as necessary for the conservation of migratory birds.

Many wading birds, including the wood stork, use the project area for foraging. Wading birds were observed feeding in the footprint of the proposed project, but no nesting activity was observed during the site visits in October and November 2012. Foraging habitat within the project site is marginal because of past land-use practices and encroachment by exotic plant species. It is anticipated that the construction of a shallow FEB or a STA would improve foraging habitat within the STA expansion, but the construction of the deep FEB would not improve foraging habitat due to the deep water depths. No migratory birds or their nests will be adversely affected by the Proposed Action. This action complies with these statutes.

6.17 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

The purpose of the National Environmental Policy Act (NEPA) is "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality" (42 USC Section 4321). It encourages public participation and comment, and it ensures that all branches of government consider environmental consequences of federal projects.

NEPA requires environmental impacts be considered within the federal decision-making process. Council on Environmental Quality (CEQ) established regulations for implementing NEPA (under Title 40 CFR Section 1500). The USACE has its own supplemental regulations for complying with NEPA (33 CFR 320) for its Civil Works Program. These regulations call for the preparation of an EIS for authorization of any major federal project that could have significant effects on the environment. The USACE Jacksonville District Commander is the responsible official for NEPA actions within the district. Ultimately, the decision whether to implement the Proposed Action, one of the other Action Alternatives, or the No Action Alternative will be made at USACE Headquarters in Washington DC. Any decision made will be in compliance with NEPA.

As stated above, NEPA requires environmental impacts be considered within the federal decision-making process. The decision to grant an approval for a change in land use under the Grant Agreement is a federal decision as contemplated by NEPA.

NEPA requires agencies to cooperate with other federal agencies and state and local governments, and to involve public stakeholders or citizens. Chapter 8 and Appendix F document the public involvement process completed as part of this EIS.

6.18 NATIONAL HISTORIC PRESERVATION ACT OF 1966, AS AMENDED

The National Historic Preservation Act (NHPA) was enacted to provide adequate protection for historic resources, including archaeological sites. The National Register of Historic Places (NRHP), National Historic Landmarks, and the posts of State Historic Preservation Officers (SHPOs) were established under this act. NHPA requires federal agencies to take into consideration the effects of their undertakings on cultural resources that are listed in, eligible for, or nominated to the NRHP. Federal agencies must consult with the SHPO and interested federally recognized Native American tribes.

Consultation with the Florida Department of State Division of Historical Resources was initiated in 2006. A Phase 1 cultural resources survey report was prepared and submitted to the SHPO. The SHPO found the report complete and sufficient in accordance with Chapter 1A-46, FAC. Based on the report recommendations, SHPO concluded that the construction of the A-1 Rreservoir would have no effect on any historic properties eligible for listing on the NRHP (See Appendix F, SHPO letter dated December 13, 2002).

In 2012, the SFWMD conducted a separate Phase 1 cultural resource assessment survey of the A-1 project area. In the Cultural Resource Assesment Report, the Bureau of Archeological Research concluded that there are no NRHP eligible sites in the project area and did not recommend further archeological work at the A-1 project site. A copy of the report is found in Appendix F. The SHPO is currently reviewing the CRAR to determine if they concur with the Bureau of Archeological Research's conclusions.

6.19 NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990

The Native American Graves Protection and Repatatriation Act of 1990 (25 USC 3001 et seq.) establishes a means for American Indians to request the return or repatriation of human remains and other cultural items presently held by Federal agencies or federally assisted museums or institutions. The act also contains provisions regarding the intentional excavation and removal of, inadvertent discovery of, and illegal trafficking in American Indian human remains and cultural items. Major actions under this law include: (a) establishing a review committee with monitoring and policymaking responsibilities; (b) developing regulations for repatriation, including procedures for identifying lineal descent or cultural affiliation needed for claims. (c) providing oversignt of museum programs designed to meet the inventory requirements and deadlines of this law; and (d) developing procedures to handle unexpected discoveries of graves or grave goods during activities on Federal or tribal lands. All Federal agencies that manage land or are responsible for archaeological collections obtained from their lands or generated by their activities must comply with this act. USACE managers of ground disturbing activities on Federal and tribal lands are to be aware of the statutory provisions treating inadvertent discoveries of American Indian remains and cultural objects. Regulations implementing the act are found at 43 CFR 10.

6.20 RESOURCE CONSERVATION AND RECOVERY ACT OF 1976, AS AMENDED

The Resource Conservation and Recovery Act (RCRA) provides guidance for hazardous waste disposal and gives USEPA the authority to establish waste management laws and regulations. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner. Chapter 3 discloses the results of investigations of hazardous waste disposals in the project footprint. The proposed project would comply with this statute.

6.21 SEMINOLE INDIAN CLAIMS SETTLEMENT ACT OF 1987

The Florida Indian (Seminole) Land Claims Settlement Act of 1987 directed the SFWMD the State of Florida, and the Seminole Tribe to execute an agreement for the purposes of resolving tribal land claims and settling the lawsuit filed by the Seminole Tribe of Florida (Seminole Tribe), which involved certain land claims within the State.

Agreements to resolve tribal land claims were executed between the three parties, which included conveyance of land and payment of consideration to the tribe, and implementing legislation by the Congress of the United States and the Legislature of the State of Florida. An agreement known as the Water Rights Compact (Compact) was executed between the State of Florida, the SFWMD, and the Seminole Tribe. The Compact specifically defined tribal water rights. This Compact was adopted into federal and state law. It includes a series of provisions establishing the Seminole Tribe's water rights and creating several "entitlements" to surface water for each of the Tribe's reservations. This project would not alter the terms of the Compact.

6.22 SOLID WASTE DISPOSAL ACT OF 1965

The Solid Waste Disposal Act of 1965, as amended by the Resource Conservation and Recovery Act of 1976 and the Hazardous and Solid Waste Amendmenets of 1984 (42 USC 6901 et seq.) as amended, govern the transportation, treatment, storeage, and disposal of hazardous waste and nonhazardous waste (that is, municipal solid waste). Under the Resources Conservation and Recovery Act of 1976, which amended the Solid Waste Disposal Act of 1965, USEPA defines and identifies hazardous waste; establishes standards for its transportation, treatment, storage, and disposal; and requires permits for persons engaged in hazardous waste activities. Regulations imposed on a generator or on a treatment, storage, or disposal facility vary according to the type and quantity of hazardous waste generated, treated, stored, or disposed, and the methods of treatment, storage, and disposal. The State of Florida has adopted by reference portions of the Federal regulations into its Florida Administrative Code Rule 62-730. Chapter 3 discloses the results of investigations of hazardous waste disposals in the project footprint. The proposed project would comply with this statute.

CHAPTER 7
CONSULTATION AND COORDINATION

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7.0 CONSULTATION AND COORDINATION

Under the National Environmental Policy Act (NEPA), all agencies are required to consider all environmental impacts for federal projects and federal rules. NEPA also requires agencies to cooperate with other federal agencies, and with state and local governments, and to involve public stakeholders or citizens. All persons and organizations that have a potential interest in the Proposed Action are urged to participate in the NEPA environmental analysis process. These persons and organizations may include federal, state, and local agencies; federally recognized Indian tribes; interested stakeholders; and minority, low-income, or disadvantaged populations. Throughout this process, the public may obtain information on the status and progress of the environmental impact statement (EIS) by contacting:

Ms. Alisa Zarbo
U.S. Army Corps of Engineers, Jacksonville District
4400 PGA Boulevard, Suite 500
Palm Beach Gardens, FL 33410
E-mail at alisa.a.zarbo@usace.army.mil
By phone at (561) 472-3506
Or by fax at (561) 626-6971

7.1 PUBLIC INVOLVEMENT

As part of public involvement, information describing the EIS process and the proposed project was distributed following NEPA guidelines. The public scoping process was initiated when the Notice of Intent (NOI) to prepare an EIS for the proposed A-1 Shallow Flow Equalization Basin (FEB) was published on August 28, 2012 [(77 FR 51981, Document No. 2012-21186, page 51981-51983) (Appendix D)]. The NOI provided information on the purpose and need for the Proposed Action, background, the alternatives to be evaluated, and the geographic locations of the project sites. The NOI further provided the date, time, and location for the scoping meeting and the point of contact information at U.S. Army Corps of Engineers (USACE) to submit comments and receive additional information.

Notification was sent on the USACE Corporate Communications e-notification list for Facebook, YouTube, Twitter, and Flicker. A news release was published on August 29, 2012 that requested input and comments on the project. The USACE also sent the public notice and notice of intent to 598 interested parties who have requested to receive notifications on the previous A-1 Reservoir mailing list, the list generated by the Florida Department of Environmental Protection (FDEP) for the A-1 Shallow FEB project, the Central Everglades Planning Project (CEPP), the River of Grass project, and parties interested in the Everglades

Agricultural Area. The list includes a broad spectrum of interested parties encompassing private individuals; local, county, state, and federal government and agencies; businesses; educational institutions; elected officials at all levels; and special interest groups. Additionally, the public scoping meeting and request for comments on the proposed project were announced on the USACE Jacksonville District Web site at:

http://www.saj.usace.army.mil/Missions/Regulatory/PublicNotices.aspx.

In addition to posting information on the websites and mailings, the USACE conducted a scoping meeting in West Palm Beach, Florida (Palm Beach County) on September 6, 2012 in an effort to help identify significant issues and data gaps and to assist in evaluating the alternatives, identifying other alternatives, and analyzing the potential impacts. The location was selected on the basis of accessibility for the public throughout the primary regions affected by the Proposed Action. Public stakeholders; representatives of federal, state, and local agencies; and federally recognized Indian tribes were contacted through mail as part of the scoping process. The mailing list was prepared using several lists of interested parties provided by the South Florida Water Management District (SFWMD), the FDEP, and USACE.

As interested parties were identified, the list was updated continuously throughout development of the EIS. Anyone who requested information on the EIS was added to the mailing list. Persons who attended the public scoping meetings or other meetings were also added to the list. USACE considered the results of the scoping process to develop a range of alternative actions, including the No Action Alternative, to develop this EIS and aid in its permit decision. The overall scoping process consisted of the following elements:

- EIS Kick-off Meeting with state and federal agencies held on August 3, 2012;
- Developing a public participation plan, in accordance with NEPA, as guidance for conducting outreach to the public;
- Publishing and announcing public scoping meetings in the *Federal Register*;
- Distributing a public notice announcing public scoping meetings and locations to federal, state, and local agencies and officials; stakeholders; and other interested parties (mailing list found in Chapter 9);
- Distributing a press release to media outlets;
- Sending agency and tribal consultation letters by mail;
- Holding a public scoping meeting to inform the public about the Proposed Action and to solicit oral and written comments on the issues that should be addressed in the EIS; and
- Reviewing and categorizing oral and written comments to be evaluated in the draft EIS.

7.2 AGENCY AND PUBLIC COMMENTS

Comments were received as a result of the public scoping meeting and in response to the USACE's public notice. Comments were received verbally and written on comment cards at the public scoping meeting, by email and by letter. The USACE considered the comments collected during development of this EIS and all comments are included in the public administrative record.

7.2.1 PUBLIC SCOPING MEETING – SEPTEMBER 6, 2012

Eighteen (18) people attended the scoping meeting in West Palm Beach (**Table 7-1**). Two comments were received on comment cards, while five comments were made verbally (one of which was also submitted on a comment card).

Table 7-1 Public Scoping Meeting Comments

Comment received by:	Comment
Public Comment Form	The project is positive for the environment, the state and local economy and the long term health of the Everglades.
Public Comment Form	Suggests that the ruminant pond apple slough be restored south of Lake Okeechobee to reduce phosphorus levels. Also suggests flow is routed through the Holey Land Wildlife Management Area and the Rotenberger tract. Recommended incorporating or implementing the 1994 Recon Study "Plan 6" but recognizes that the land is not acquired.
Verbal	Commenter reiterated comment made on the Public Comment Form concerning the 1994 Recon Study Plan 6, and suggested pond apple slough be restored south of Lake Okeechobee.
Verbal	Requested that a reservoir or deep FEB be evaluated as an alternative. The alternative analysis should analyze the reservoir would have greater flow attenuation that would have greater phosphorus reduction but would cost more money.
Verbal	A question was asked about the difference between the A-1 and A-2 FEB. The USACE provided a verbal response and clarified that the A1 FEB is proposed by the SFWMD while the A-2 FEB is a separate project that is part of the federal project, CEPP. CEPP is evaluating a separate A-2 FEB on lands west of the A-1 project site as a federal Planning project. The EIS is only for the SFWMD's proposed project (the A-1 FEB) since they are separate independent projects.
Verbal	The EIS process should compare the benefits with the cost as specified in the White House document, Sustaining Environmental Capital: Protecting Society and the Economy, a report completed in July 2011.

7.2.2 PUBLIC NOTICE FOR SCOPING MEETING

The NOI, public notice, and news release commenting process resulted in the submission of eight (8) comments, two of which simply requested to be on the email distribution list (Table 7-2). One comment stated that the CEPP workshop in Miami was planned on the same night as the A-1 Shallow FEB scoping meeting in West Palm Beach. Therefore, USACE rescheduled the CEPP workshop so there would be no conflicts in the public's opportunities to attend either or both meetings. The comments in response to the public notice for the scoping meeting are described below:

Table 7-2 Scoping Meeting Public Notice Comments

Comment received by:	Comment
Email	Support was given for the A-1 FEB project and the improvements to improve water quality. The commentor was optimistic that the project would not negatively impact wildlife, and the construction process should minimize any take of wildlife.
Email	The USACE was informed that a CEPP workshop was scheduled in Miami on the same night as the A-1 Shallow FEB workshop in West Palm Beach.
Email	Florida Power and Light (FPL) requested information on the location of any FPL facilities in the project area.
Email	A request was made to send an electronic copy of the public notice.
Comment letter	Audubon Florida, Florida Oceanographic Society expressed support for the A-1 FEB project, and requested that the analysis be conducted in a timely manner to realize the benefits quickly. The letter requested further discussion concerning wetland mitigation and the effects of operation.
Comment letter	Florida Fish and Wildlife Conservation Commission provided a copy of their letter to the Florida Department of Environmental Protection stating that (1) all state listed species should be considered in the evaluation, (2) recreation use should be incorporated, (3) that the effects on Holey Land Wildlife Management Area and Water Conservation Area 2 and 3 be evaluated, and (4) a contingency plan be developed if it is found that a water storage shortfall is discovered.

7.2.3 PUBLIC NOTICE FOR RELEASE OF DRAFT EIS

The USACE coordinated the project on the USACE's website on 22 February 2013 with a 45 day comment period to coincide with the release of the public notice. One comment was received requesting a hard copy of the EIS. The document was provided to the commentor. Two commentors requested to review the modeling data, which was provided to the commentors by FTP site on March 1, 2013. The State Clearinghouse and the Seminole Tribe of Florida also provided comments in response to the draft EIS. The comment letters and a comment matrix which describes the responses are included in Appendix J.

7.3 AGENCY COORDINATION

7.3.1 COOPERATING AGENCIES

The USACE invited the United States Environmental Protection Agency (USEPA), the Department of Interior (DOI), and the U.S. Fish and Wildlife Service (USFWS) to become a cooperating agency on the EIS by letter dated October 9, 2012. The USEPA accepted cooperating agency status on October 16, 2012, while the DOI accepted on October 30, 2012. The USFWS agreed to assist with the development of the federally-listed threatened and endangered species portion of the EIS. A separate interagency scoping meeting was deemed not necessary and instead early agency involvement occurred during weekly phone conference meetings and through the development of the content of the EIS.

7.3.2 U.S. FISH AND WILDLIFE SERVICE

On February 22, 2013, the USACE consulted formally with the USFWS under the Endangered Species Act and provide a Biological Assessment that analyzes the effects of the project on federally listed threatened or endangered species. The USFWS provided a comment letter dated March 27, 2013, requesting for information needed to complete the Biological Opinion. The Corps provided the information by email on April 10, 2013.

7.3.3 STATE HISTORIC PRESERVATION OFFICE

The Bureau of Archaeological Research conducted a Phase I archaeological survey of the 16,593 acre A-1 project site in September 2012. The survey was conducted to comply with Section 106 of the National Historic Preservation Act of 1966 (PL89-665, as amended) and Section 267 of the Florida Statutes to consider the effects upon historic properties and historic properties eligible for listing in the National Register of Historic Places. The survey also evaluated all potential cultural resources in the project area. The Cultural Resource Assessment Report for the A-1 project site was completed on September 27, 2012, and provided to the State Historic Preservation Officer (SHPO), Division of Historical Resources. The SHPO reviewed the report and the draft EIS and provided a letter dated March 7, 2013, that the project is unlikely to adversely impact any historic or archaeological resources.

7.4 TRIBAL COORDINATION

The USACE notified the Seminole Tribe of Florida (Seminole Tribe) and the Miccosukee Tribe of Indians of Florida (Miccosukee Tribe) of the NOI, public notice, and public scoping meeting. On September 4, 2012, the Seminole Tribe requested by letter that the USACE formally invite the Seminole Tribe to participate in the NEPA process as a cooperating agency on the EIS. The USACE and the Seminole Tribe discussed the request by telephone on September 17 and met in person on September 27, 2012, to discuss the process and consider all possibilities of being a cooperating agency. After the meeting on September 27, the Seminole Tribe provided a letter stating that the NEPA and the federal Trust responsibility of formal coordination could occur concurrently, and outlined outstanding issues: Environmental concerns with water sources, flow routes and operation, and impacts to tribal lands and usage rights; and cultural resource concerns with the broader landscape of environmental restoration projects. The Seminole Tribe stated that they would reconsider their request to be a cooperating agency on the EIS. The Miccosukee Tribe did not provide any comments.

The USACE initiated Government-to-Government consultation with all federally recognized Native American Indian Tribes with interests in the State of Florida, including the Seminole Tribe, the Miccosukee Tribe, the Poarch Band of Creek Indians, the Seminole Nation of Oklahoma, the Muscogee (Creek) Nation of Oklahoma, as well as the Tribal Historic Preservation Officer, and the Advisory Council on Historic Preservation on February 22, 2013 (Appendix J). Through personal discussions with the Miccosukee Tribe, the USACE was advised that no comments will be provided. The USACE received comments from the Seminole Tribe on the draft EIS and provided a written response (Appendix J). The USACE also incorporated the Seminole Tribe's comments in the final EIS.

CHAPTER 8
PERMITS AND LICENSE

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8.0 PERMITS AND LICENSES

This section summarizes the federal permits and licenses that will be required for the action alternatives. The South Florida Water Management District (SFWMD) is responsible for obtaining the required regulatory documents and approvals. Chapter 6 described compliance with environmental requirements, which includes many of the same agencies and regulatory requirements as described below.

8.1 CLEAN WATER ACT, SECTION 404 PERMIT

The construction of the Shallow Flow Equalization Basin (FEB), Deep FEB or Stormwater Treatment Area (STA) will require a Clean Water Act Section 404 Permit issued by the U.S. Army Corps of Engineers (USACE). Under Section 404 of the Clean Water Act, discharge of dredged or fill material into waters of the United States is subject to Section 404 regulation. This environmental impact statement (EIS) has been prepared in accordance with National Environmental Policy Act (NEPA) and Council on Environmental Quality Act (CEQ) regulations and will serve as the primary document to aid the USACE in its decision to issue, issue with special conditions, or deny the Section 404 Permit for the proposed project. A permit application has been submitted to USACE. Once a Record of Decision (ROD) has been finalized for the EIS and all NEPA requirements completed, final agency action for the U.S. Department of the Army (DA) 404 permit decision will be made.

8.2 COASTAL ZONE MANAGEMENT ACT

The National Oceanic and Atmospheric Administration has the authority to administer the federal Coastal Zone Management Program (CZMP) under the Coastal Zone Management Act (CZMA). The purpose of the CZMP is to protect, preserve, develop, restore, or enhance the coastal environment. States are required to develop coastal management programs to protect and manage uses in the coastal zone. The Florida Department of Environmental Protection (FDEP) will determine CZMP consistency for the proposed action.

8.3 SECTION 7 ENDANGERED SPECIES ACT

Under Section 7 of the Endangered Species Act (ESA), federal agencies are required to consult with the United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service for activities that are funded, permitted, or carried out that may affect federally listed species including designated critical habitat. This project would require a Biological Opinion from the USFWS for the effects of the project on the threatened eastern indigo snake. The USACE is in formal consultation with the USFWS. The USFWS will finalize the Biological Opinion prior to final agency action for the DA Section 404 permit decision.

8.4 CLEAN AIR ACT

Pump stations would be required for the action alternatives, which may require a permit under the Clean Air Act (CAA). Final pump station designs will be in compliance with the requirement. The SFWMD would apply for these permits during the construction phases, which FDEP and the U.S. Environmental Protection Agency (USEPA) would review for compliance with the requirements of the CAA.

The FDEP is responsible for Title V air permits, which regulate both major and minor facilities based on emissions. In order to determine the applicable air permit for the facility, there are three permitting thresholds to consider:

- Exempt from permitting: Station will consume less than 32,000 gallons per rolling year. This is a self-implementing exemption.

- State General Permit: Station will consume less than 250,000 gallons per rolling year. A General Permit can be obtained at least 30 days prior to operation and permit is valid for 5 years.

- Title V Operation Permit: Station has the potential to emit more than 100 tons per year of NO_x. Title V Air Construction Permit must be issued prior to construction. It takes about 6 to 8 months lead time to get permit and permit is valid for 5 years.

Final pump station designs will control the requirement. SFWMD will apply for the appropriate permit during the construction phases of the project, which FDEP and USEPA will review for compliance with the requirements of the CAA.

8.5 EVERGLADES FOREVER ACT PERMIT/SECTION 401 CERTIFICATION

Prior to issuance of a DA 404 permit, State Water Quality Certification (WQC) must be provided. The FDEP will issue the WQC in the form of an Everglades Forever Act (EFA) permit. Pursuant to Florida Statutes, Chapter 373.4592, Florida Legislature authorizes FDEP to issue EFA permits to SFWMD for projects that are part of the Long-Term Plan. EFA permits required for construction, operation, and maintenance of the facilities are issued for 5-year terms and renewed as appropriate. SFWMD has submitted an EFA permit application to the FDEP for the Shallow FEB under file number 0313994-001 .

8.6 NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMIT FOR OPERATIONS

The National Pollution Discharge Elimination System (NPDES) permitting program regulates point sources that discharge pollutants in waters of the United States. FDEP administers Florida’s NPDES permits under Sections 403.088 and 403.0885 of Florida Statute, from authority granted by USEPA. The issued NPDES permits anticipate operation of the Shallow FEB and no modification would be required if the Shallow FEB is authorized. If the STA alternative is authorized, the existing permits would need to be modified once construction activites are completed.

8.7 NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMIT FOR CONSTRUCTION

An NPDES stormwater permit for construction under FAC Rule 62-621.300(4) is required for all of the Action Alternatives. The selected contractor will apply for the NPDES permit from FDEP and must provide a stormwater pollution prevention plan prior to start of construction if one is required.

8.9 FEDERAL REQUIREMENTS UNDER 1996 FARM BILL, SECTION 390

The action alternatives will require the approval of the USFWS/DOI. Under Section 390 of the 1996 Farm Bill (Public Law 104-127, 110 Statue 1022, April 1996), funds were provided to the Secretary of the Interior to fund or conduct restoration activities in the Everglades ecosystem. Under Section 390, the Secretary of the Interior has the responsibility to ensure that Section 390 funds are used for restoration purposes. The project site lands were purchased with Section 390 funds and title was transferred to the SFWMD pursuant to a Grant Agreement. Pursuant to the terms of the Framework Agreement and Grant Agreement referenced in earlier chapters of this EIS, the SFWMD must request and receive approval of the USFWS/DOI for any change in land use.

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CHAPTER 9
LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE ENVIRONMENTAL IMPACT STATEMENT ARE SENT

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9.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE ENVIRONMENTAL IMPACT STATEMENT ARE SENT

The following is a list of agencies, organizations and persons to whom the copies of the Draft Environmental Impact Statement (EIS) are sent.

9.1 PAPER COPY

The following libraries, agencies, organizations, and Native American Indian Tribes were sent a paper copy of the Draft EIS:

Federal Agencies
U.S. Army Corps of Engineers, Palm Beach Gardens, FL
U.S. Department of the Interior, Everglades Restoration Initiatives, Homestead, FL
U.S. Environmental Protection Agency, NEPA Compliance Division, Washington, DC
U.S. Environmental Protection Agency, Jacksonville, FL
U.S. Fish and Wildlife Service, Vero Beach, FL

Libraries
Belle Glade Branch Public Library, Belle Glade, FL
Clewiston Public Library, Clewiston, FL
Glades County Public Library, Moore Haven, FL
Legislative Library, Tallahassee, FL
Luola V York Library, Pahokee, FL
Palm Beach County Main Library, West Palm Beach, Fl
South Bay Public Library, South Bay, FL

Native American Indian Tribes
Miccosukee Tribe of Indians of Florida, Ochopee, FL
Miccosukee Tribe of Indians of Florida, Miami, FL
Seminole Tribe of Florida, Clewiston, FL
Seminole Tribe of Florida, Hollywood, FL

State Agencies
Florida Department of Environmental Protection, Florida State Clearinghouse, Tallahassee, FL
South Florida Water Management District, West Palm Beach, FL
State Historic Preservation Office, Division of Historical Resources, Tallahassee, FL

Public
Two members of the public requested a hard copy of the draft EIS and will be sent a hard copy of the final EIS.

9.2 COMPACT DISK

The following agencies, organizations, persons, and Native American Indian Tribes were provided a compact disk (CD) of the draft EIS:

Federal Agencies
U.S. Army Corps of Engineers, Palm Beach Gardens, FL
U.S. Department of the Interior, Everglades Restoration Initiatives, Homestead, FL
U.S. Environmental Protection Agency, Jacksonville, FL
U.S. Environmental Protection Agency, NEPA Compliance Division, Washington, DC
U.S. Fish and Wildlife Service, Vero Beach, FL
National Resources Defense Council, New York, NY

Local Agencies
Audubon Society of the Everglades, Lake Worth, FL
Audubon Florida, Florida Oceanographic Society
Florida Fish and Wildlife Conservation Commission, West Palm Beach, FL
Four Seasons Towers, Miami, FL
Sierra Club Loxahatchee Group, Lake Worth, FL

Native American Indian Tribes
Miccosukee Tribe of Indians of Florida, Ochopee, FL
Miccosukee Tribe of Indians of Florida, Miami, FL
Seminole Tribe of Florida, Clewiston, FL
Seminole Tribe of Florida, Hollywood, FL

Public
Church, Jed; Lakeland, FL
Florida Power and Light, Juno Beach, FL
Four Seasons Tower, Miami, FL
Lewis Longman and Walker, West Palm Beach, FL
Marshall, Joan; Lake Worth, FL
Musgrove, Martha; West Palm Beach, FL
Northwestern University Environmental Policy & Culture Program, Evanston, IL
Sierra Club, Loxahatchee Group, Lake Worth, FL

State Agencies
Florida Department of Environmental Protection, Florida State Clearinghouse, Tallahassee, FL
Florida Fish and Wildlife Conservation Commission, West Palm Beach, FL
South Florida Water Management District, West Palm Beach, FL
State Historic Preservation Office, Division of Historical Resources, Tallahassee, FL

9.3 POSTCARD NOTIFICATION

The following agencies, organizations, and persons were notified by letter that the Draft EIS is posted on the United States Army Corps of Engineers (USACE)'s website.

Federal Agencies

Biscayne Bay National Park, Homestead, FL
Everglades National Park, Homestead, FL
Federal Emergency Management Administration, Atlanta, GA
Federal Emergency Management Administration, Washington, DC
Federal Highway Administration, Tallahassee, FL
Federal Maritime Commission, Washington, DC
National Oceanic & Atmospheric Administration, Florida Keys National Marine Sanctuary, Marathon, FL
National Oceanic & Atmospheric Administration, National Marine Fisheries Service, St. Petersburg, FL
National Park Service, Atlanta, GA
National Resources Defense Council, New York, NY
National Wildlife Federation, Atlanta GA
Natural Resources Conservation Service, Gainesville, FL
U.S. Army Corps of Engineers, Atlanta, GA
U.S. Army Corps of Engineers, Palm Beach Gardens, FL
U.S. Coast Guard, 7th District, Miami, FL
U.S. Department of Agriculture, NRCS District, Florida City, FL
U.S. Department of Agriculture, NRCS, Gainesville FL
U.S. Department of Agriculture, Hobe Sound, FL
U.S. Department of Agriculture, Okeechobee, FL
U.S. Department of Agriculture, Palatka, FL
U.S. Department of Commerce, Silver Springs, MD
U.S. Department of Energy, Washington, DC
U.S. Department of HUD, Atlanta, GA
U.S. Department of the Interior, Environmental Policy and Compliance, Washington, DC
U.S. Department of the Interior, Everglades Restoration Initiatives, Homestead, FL
U.S. Department of Justice, Environmental and Natural Resources Division, Miami, FL
U.S. Environmental Protection Agency, NEPA Compliance Division, Washington, DC
U.S. Environmental Protection Agency, NEPA Program Office, Atlanta, GA
U.S. Environmental Protection Agency, Office of Environmental Compliance, Washington, DC
U.S. Environmental Protection Agency, Office of Policy and Management, Atlanta, GA
U.S. Environmental Protection Agency, Jacksonville, FL
U.S. Environmental Protection Agency, West Palm Beach, FL
U.S. Fish and Wildlife Service, Atlanta, GA
U.S. Fish and Wildlife Service, Lake Worth, FL
U.S. Fish and Wildlife Service, Loxahatchee Wildlife Refuge, Boynton Beach, FL
U.S. Fish and Wildlife Service, Vero Beach, FL

U.S. Geological Survey, Fort Lauderdale, FL

Libraries
Belle Glade Branch Public Library, Belle Glade, FL
Clewiston Public Library, Clewiston, FL
Glades County Public Library, Moore Haven, FL
Legislative Library, Tallahassee, FL
Luola V York Library, Pahokee, FL
Palm Beach County Main Library, West Palm Beach, Fl
South Bay Public Library, South Bay, FL

Local Agencies and Entities
Airboat Association of Florida, Miami, FL
Arthur R. Marshall Foundation and Florida Environmental Institute, West Palm Beach, FL
Audubon of Florida, Tallahassee, FL
Audubon Society of the Everglades, Lake Worth, FL
Center for Environmental Health, Atlanta, GA
City of Belle Glade, Belle Glade, FL
City of Clewiston, Clewiston, FL
City of Pahokee, Pahokee, FL
City of South Bay, South Bay, FL
Clewiston City Commissioner, Clewiston, FL
The Conservancy, Naples, FL
Dairy Farmers, Inc, Maitland, FL
Environmental and Land Use Law Center, Davie, FL
Florida Cattleman's Association, Kissimmee, FL
Florida Citrus Mutual, Lakeland, FL
Florida International University, South Florida Ecosystem Restoration Task Force, Miami, FL
Florida Sierra Club Everglades, Fort Lauderdale, FL
Florida Sportsman Conservation Association, West Palm Beach, FL
Florida Sugar Cone League, Clewiston, FL
Florida Wildlife Federation, Tallahassee, FL
FLO-Sun, Inc, West Palm Beach, FL
Friends of the Everglades, Miami Springs, FL
Friends of Lake Okeechobee, Okeechobee, FL
Glades County, Moore Haven, FL
Governmental Responsible Council, Tallahassee, FL
Gulf Citrus Growers, Labelle, FL
Hendry County, Labelle, FL
Lake Region Audubon Society, Winter Haven, FL
League of Women Voters, Plantation, FL
Martin County, Stuart, FL
Miami Herald, Miami, FL
Belle Glade Municipal Complex, Belle Glade, FL

National Audubon Society, Miami, FL
National Audubon Society, Tavernier, FL
National Parks Conservation Association, Hollywood, FL
The Nature Conservancy, Altamonte Springs, FL
New Hope Sugar, Loxahatchee, FL
Okeelanta Corps, Loxahatchee, FL
Pahokee Chamber of Commerce, Pahokee, FL
Pahokee Marina, Pahokee FL
Palm Beach County, West Palm Beach, FL
The Palm Beach Post, West Palm Beach, FL
Ridge Audubon Society, Babson Park, FL
Save the Manatee Club, Maitland, FL
Sierra Club Loxahatchee Group, Lake Worth, FL
South Dade Land Corp, Homestead, FL
South Florida Agricultural Council, Labelle, FL
St. Lucie River Initiative, Stuart, FL
Sugar Cane Growers Coop, Belle Glade, FL
SW Florida Regional Planning Council, Fort Myers, FL
Talisman Sugar Corp, Stuart, FL
Tropical Audubon Society, Miami, FL
U.S. Sugar Corporation, Clewiston, FL

Native American Indian Tribes
Bureau of Indian Affairs, Hollywood, FL
Bureau of Indian Affairs, Washington, DC
Miccosukee Tribe of Indians of Florida, Miami, FL
Seminole Tribe of Florida, Clewiston, FL
Seminole Tribe of Florida, Hollywood, FL

Public
Carney Environmental Consulting, Miami, FL
Jed Church, Lakeland, FL
John Geddie, Albuquerque, NM
Landers & Parsons, Tallahassee, FL
LBFH, Inc, West Palm Beach, FL
Frederico & Lamb Macvicar, West Palm Beach, FL
Joan Marshall, Lake Worth, FL
Martha Musgrove, West Palm Beach, FL

State Agencies
Florida Department of Agriculture and Consumer Services, Tallahassee, FL
Florida Department of Agriculture and Consumer Services, West Palm Beach, FL
Florida Department of Environmental Protection, Tallahassee, FL
Florida Department of Environmental Protection, Ecosystem Planning, Tallahassee, FL

Florida Department of Environmental Protection, Florida Coastal Management Program, Tallahassee, FL
Florida Department of Environmental Protection, Florida State Clearinghouse, Tallahassee, FL
Florida Department of Environmental Protection, Water Resource Management and Environmental Planning, Tallahassee, FL
Florida Department of Environmental Protection, Wetlands Resource Management, Tallahassee, FL
Florida Department of Transportation, Fort Lauderdale, FL
Florida Department of Transportation, Fort Myers, FL
Florida Department of Transportation, Tallahassee, FL
Florida Fish and Wildlife Conservation Commission, Tallahassee, FL
Florida Fish and Wildlife Conservation Commission, Vero Beach, FL
Florida Fish and Wildlife Conservation Commission, West Palm Beach, FL
Florida Inland Navigation District, Jupiter, FL
Florida International University, Miami, FL
Florida Power and Light, Juno Beach, FL
House of Environmental Protection Committee, Tallahassee, FL
South Florida Water Management District, West Palm Beach, FL
State of Florida, Office of the Governor, Tallahassee, FL
State Historic Preservation Office, Division of Historical Resources, Tallahassee, FL
Trust for Public Lands, Miami, FL

Appointed Offices
Congressman, West Palm Beach, FL
Representative, District 78, Delray Beach, FL
Representative, Fort Lauderdale, FL
Representative, Palm Beach Gardens, FL
Representative, District 84, Riviera Beach, FL
Representative, District 77, Sebring, FL
Representative, Stuart, FL
Senator, Coral Gables, FL
Senator, Green Acres, FL
Senator, Miami, FL
Senator, Port St. Lucie, FL
Senator, West Palm Beach, FL

9.4 EMAIL NOTIFICATION

The following agencies, organizations, and persons were notified by email that the Draft EIS is posted on the USACE's website, and was provided a link to the web address. There are a total of 164 email addresses to the various agencies and public entities.

Agency and Public Entities	Agency and Public Entities
ADA Engineering, Inc.	MacVicar Consulting, Inc.
ARM Loxahatchee National Wildlife Refuge	Malcolm Pirnie, Inc.
Audubon Florida, Oceanographic Society and Natural Resources Defense Council	Miccosukee Tribe of Indians of Florida
Audubon of Florida	Mock Roos & Associates, Inc.
Audubon Society	National Park Service
Broward County	National Marine Fisheries Service, Habitat Conservation Division
Brown & Caldwell	National Marine Fisheries Service, Protected Resources Division
Burns & McDonnell Engineering Company, Inc.	Northwestern University
CH2M Hill	The Ohio State University
Conestoga-Rovers & Associates	Parsons Brinckerhoff
DB Environmental, Inc.	Pavese Law Firm
EAA Research & Management, Inc.	Powell Kugler Inc.
Ed Barber & Associates	public
Engineering & Applied Science	Scheda Ecological Associates, Inc.
EPA, Office of Water Legal Support	Seminole Tribe of Florida
Everglades Foundation	Shaw Engineering and Infrastructure Group
Everglades National Park	Sierra Club Loxahatchee Group
Federico, Lamb & Associates, Inc.	South Florida Water Management District
Florida Cracker Story Teller	State Historic Preservation Office
Florida Department of Agriculture and Consumer Services	Sugar Cane Growers Cooperative of Florida
Florida Department of Environmental Protection	Sutron Corporation
Florida Fish and Wildlife Conservation Commission	TBE Group
Florida Power and Light	Tew Cardenas LLP
Florida Wildlife Federation	Town Crier
The Forum	U.S. Army Corps of Engineers
Gary Goforth, Inc.	U.S. Coast Guard
Godwin Pumps	U.S. Department of the Interior
Higgins Engineering	U.S. Environmental Protection Agency
JAS Water Resource Consulting, Inc.	U.S. Fish and Wildlife Service
Kimley-Horn and Associates, Inc.	University of Florida
Lake Worth Drainage District	University of Florida, IFAS
Landers & Parsons	URS Corp.
Lewis, Longman & Walker, P.A	Wetlands Ecosystem Research Group
Loxahatchee Groves Water Control District	Wetland Solutions, Inc.

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CHAPTER 10
REFERENCES

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